THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

VOL. IX. No. 193—12th YEAR.] LONDON, MARCH 13, 1860. [Subscription per Ann. { 15s. in Advance / 18s Credit.] DOUBLE No. Price 1s.

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THE Walsall Improvement COMMISSIONERS are prepared to receive Tenders for the Construction and Erection of FOUR DRY PURIFIERS, with Centre Valve and proper Connexions at their Gas-Works.

The Model, Plans, and Specification may be inspected, and any further information obtained, at the Gas-Works, in Wolverhampton Road.

Tenders, sealed, and marked "Tender for Purifiers," to be sent to the Commissioners' Clerk's Office, Bridge Street, WALSALL, on or before the 22nd of March instant.

The Commissioners may, if they think proper, require the Contractor to give security for the performance of the Contract.

S. WILKINSON, Jun., Commissioners' Clerk.

Walsall, March 5, 1860.

TO METER MANUFACTURERS.

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Walsall, 5th March, 1860.

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Particulars will be forwarded upon application to Mr. MORTON, Equitable Gas-Works, WOOLWICH.

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THE TEIGNMOUTH LOCAL BOARD ...reby give notice, that on Tuesday, the 20th day o...March instant, they will proceed to the election of a ...VEYOR.

The ...erson appointed will be required to undertake prop... the superintendence of the Water-Works, the G... Works, the Highways, Sewerage, and all other Wor... within the jurisdiction of the Local Board, and to pr...are all Plans and Specifications which may be requ...d by the Local Board for the execution of the Wor... which may from time to time be necessary.

No person need apply who has not such competent knowledge as to enable him properly to perform the duties required.

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W. R. HALL JORDAN, Clerk to the Local Board.

Teignmouth, March 6, 1860.

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Apply to Mr. JOHN ROMANS, Engineer and Secretary, Gas Company, Devonport.

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Plans and Specifications may be seen at the offices of the Company, at Bath, and at the offices of Messrs. John Eunson and Son, Gas Engineers, Wolverhampton.

Tenders to be addressed to the CHAIRMAN of the Gas Company, Bath, on or before March 20, marked "Tender for Gasholder."

The Company do not pledge themselves to accept the lowest Tender.

GAS APPARATUS WANTED.

THE Directors of the Cork Gas CONSUMERS' COMPANY (LIMITED) request Tenders for the supply of a WET LIME PURIFIER, of 15 feet in diameter.

Also an OUTER LIFT for a Gasholder, upwards of 100 feet in diameter and 18 feet in depth.

Plans and Specifications may be seen here, or at the office of GEORGE ANDERSON, Esq., C.E., 104, Leadenhall Street, LONDON, Engineer to the Company.

The Directors do not bind themselves to accept the lowest tender.

Tenders must reach the Company's Offices before 12 o'clock on Saturday, the 17th of March next.

Company's Offices, 72, South Mall.

Feb. 18, 1860.

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JOURNAL OF GASLIGHTING NEWSPAPER PENNY

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PATENT DRY GAS-METERS.

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PATENT DRY GAS-METER MANUFACTURER,

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LORD REDESDALE'S "SALE OF GAS BILL."

LONDON, August 15, 1859.

THOMAS GLOVER takes the earliest opportunity of intimating to Gas Companies and his other Customers that, as Lord Redesdale's "Sale of Gas Bill" has determined the unit of measurement, he is now prepared to supply his Patent Dry Gas-Meters guaranteed to meet all the legal requirements of that bill.

THOMAS GLOVER confines his sole attention to the business of Gas-Meter Making. The propriety of his doing so is satisfactorily proved by his success; and, without the practice of any quackery, or any attempt to delude the public by an absurd exhibition of "Old and New Valves," his Meters are in general use by the Metropolitan Gas and other Companies in this Country and abroad. For example, one Metropolitan Company have now in use above **12,500** of his Patent Dry Gas-Meters; some of these Meters have been fixed for Fourteen Years, and are still in working order, without complaint from either the Company or the Consumer.

THOMAS GLOVER thinks it necessary to put Gas Companies on their guard against parties selling Patent Dry Gas-Meters constructed in imitation of his, but unskilfully made on erroneous principles, and with improper and unsuitable materials.

THOMAS GLOVER'S Workshops are now the most extensive in this or any other Country, and he is thereby enabled promptly to execute orders to any extent required. Purchasers may at any time inspect his Works and the Materials of which his Meters are constructed. He is ready to enter into Contracts with Gas Companies and others to uphold their Stock of his Meters for Twenty Years at an annual charge varying from 2½ to 5 per cent., and to leave always in the hands of Gas Companies Three Years' charge for upholding, as a guarantee for the fulfilment of the Contract.

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ARE PREPARED TO SUPPLY GAS COMPANIES AND OTHERS WITH

DUPLICATES of Mr. KING'S CUBIC FOOT TRANSFERRER,

Similar to that Manufactured by them, and verified by

The ASTRONOMER ROYAL, and Professor MILLER, of Cambridge,

ON BEHALF OF THE GOVERNMENT,

Which was deposited by C. and Co. in the Office of the
COMPTROLLER-GENERAL of the EXCHEQUER before Nov. 13, in compliance with the

"ACT FOR REGULATING MEASURES USED IN SALES OF GAS."

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TEST GASHOLDERS,

Graduated by the Standard Cubic Foot.

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NOTICES.

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THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, MARCH 13, 1860.

NOTES UPON PASSING EVENTS.

THE last few weeks have added in a fearful manner to the sad list of accidents by which the death rate in industrial nations is so seriously affected; and the loss of life by mine explosions, and by shipwreck, has been so great as to afford a strange commentary on the doctrine of the so-called natural law of mortality. It seems that such accidents must needs come, for all the improvements in the adaptation of physical science, all the legislative provisions we have lately prided ourselves upon, as furnishing some guarantees against their recurrence, have been proved to be equally inefficient for that end. Nay rather, it may even be suspected that the tendency to cast upon others the duty of guarding against the consequences of natural laws, which is fostered by the reliance on what may he styled mechanical safeguards, or on official supervision, has superinduced a very dangerous spirit of carelessness and a systematic neglect of ordinary precautions in the pursuits we have especially referred to. Be this as it may, the number of victims by mine explosions and shipwrecks has been of late more than usually great; and it must inspire anxiety in the minds of all thinking people. Surely, some of these deaths must be preventable: why, then, should society be still exposed to the grief and suffering they must entail?

In the case of the explosion at the Higham Colliery, it seems that the use of open candles by the miners was the proximate cause of the misfortune; and, as dead men tell no tales, we are assured that the Government Inspector had frequently expostulated with the workmen on the subject of their carelessness. It has been insinuated that the effect of these official warnings was rendered nugatory by the fact that the bottom steward of the mine had a direct interest in the sale of candles. An assertion of this description ought to be probed to the uttermost; and, if true, the parties who were actually guilty, as well as those who tolerated a system so capable of abuse, ought to be severely punished; if not true, the authors of the report ought to be punished with nearly equal severity. The case of the infinitely more fatal accident at the Burradon Colliery is still involved in mystery; and the precise cause, or the precise conditions of the explosion, have not yet been identified. The coroner's inquest is impotent, under these circumstances; the Government inspection is even more impotent to guarantee the miners against these accidents, or to apportion the blame and the punishment which should follow them. If we be not mistaken, however, there is some vague connexion between the periodical recurrence of these explosions in great numbers and the principal phases of the earth's motion upon the ecliptic; and we would urge those who are in the position to study these scientific questions, to examine the possible relations between the terrestial and the astronomical phenomena. The spontaneous disengagement of gases from coal mines must, we suspect, have a direct relation to atmospheric conditions, even if not to telluric ones.

And, whilst thus alluding to the actions of the grand laws of nature, it may here be worth while to call attention to some of the effects of the recent gale of the 28th of February, because they have been of a nature to bear practically upon the interest of some of our readers. The gale, on this occasion, was of unusual severity, and it seems to have raged all over North Western Europe, with equal force. In the neighbourhood of Narbonne, it is said that a railway train was actually blown off the rails, and precipitated into a ravine; in the midland counties of England, steeples and chimney stalks were blown down in great numbers; on the shores of Norfolk, Suffolk, and Essex, the mischief done to houses and shipping was very serious; whilst, in Holland, we hear that not only has the chimney of one small Gas-work been blown down, but that a large Gasholder was blown over at the Hague, and that an explosion ensued from this cause. We have been informed, but, it must be said, not on any reliable authority, that in London itself one wind gauge actually indicated that the force of the gale was, for a time, not less than 33lbs. on the square foot; and that, having indicated this pressure, the gauge was blown away. Of course, if the former part of this tale (viz., the one connected with the force of the gale) be true, there can be no reason to doubt the latter part; but, be that as it may, it would form a subject for valuable investigation, were any one to calculate the actual force which must have been required to overthrow any of the buildings above named. Would any of our readers furnish us with authentic particulars of the dimensions of any chimneys thus blown down, bearing especially in mind the circumstances under which they received the shock of the gale?

Another curious fact connected with the natural history of Gas and Water Works has lately been brought under our notice, to which we urgently direct the attention of professional men. It is the asserted change in the structure of some of the mains of the New River Company, in consequence of their contact with the earth; and the much more certain change which takes place in the structure of the mains laid under similar circumstances in the town of St. Helen's, Lancashire. What are the precise conditions of this action? What is the remedy for it when it exists? Does it take place in the alluvial deposits from the sea? or is it confined to the soils of such towns as St. Helen's, which are impregnated with the salts contained in the refuse from chemical works?

We dwell a little on these questions of natural science, because there is rather a disposition amongst our talkers to indulge in strains of gratulation for the supposed advance of the age in all such branches of knowledge, and yet at every turn the true philosopher finds himself compelled to acknowledge "how vast is art, how narrow human wit." Moreover, it would appear, from the statements of the public press, that whatever may be the state of general education in scientific matters, people in high places are often deficient of even "the little knowledge," which, though dangerous, is yet better than none at all. Thus, for instance, the deputation, headed by Mr. Lillwall, upon the subject of Messrs. Easton and Amos's proposition for pumping Thames water into the Serpentine, finding that Mr. Cowper knew absolutely nothing of the matter he was supposed to decide, uttered a series of assertions as discreditable to themselves as they were to the understanding of the amiable First Commissioner of Works. Amongst other things, a Dr. Lankaster coolly said that filtration deprives water of its oxygen! and Mr. Woolley made it an accusation against the

water of the Serpentine, that when people were nearly drowned in it, they were often permanently injured by the *mud*—as though the shock of such an accident were not of itself sufficient to produce this result! Again, in the debate in the House of Commons on Friday night last, Mr. Cowper himself coolly stated that the stone used in building the Houses of Parliament had failed, because "it did not contain those exact proportions of carbonate of lime and carbonate of magnesia which were expected to make it indestructible!" Really, it is too bad for even Mr. Cowper to utter such trash as this. He should avow his ignorance of such technical questions, rather than display it in so ludicrous a manner. And yet this kind, amiable nonentity has been thrust into one place after another in which a general acquaintance with science is required! and in the meantime, candidates for landing waiters places are plucked, if they cannot go through severe examinations. Oh, that natal silver spoon!

"Why not English?" asks our contemporary, the *Builder*, in one of his critical moods; and so we asked when we read the last Quarterly Report of the Registrar-General, and the remarks of the *Times* on the results of the Civil-Service Examinations. Why, indeed, do we allow the heads of Departments to print constantly, at the expense of the nation, documents which would disgrace any of the rejected candidates themselves, on account of the bad English, bad grammar, and false logic they contain? We do not stop to point out the more than questionable philosophy contained in the assertion of the report alluded to, that "typhoid fever" is a kind of night soil fever, because it is so notorious that typhoid fevers are the most common in districts of a swampy, undrained, nature (the Fens, for instance), that no possible evil can result from the publication of a doctrine so absurd. But there is one important part of the Report which contains such a helpless display of ignorance, that it behoves all who are interested in the scientific reputation of the country to protest against the publication of such nonsense. After giving a description, worthy of Mrs. Gamp herself, of the symptoms of the disease he is pleased to call typhia, the Registrar-General flounders through some sentences, from which the only logical conclusion is that typhia is contagious; and then he goes on to say, "The returns afford evidence of the efficacy of sanitary measures. Thus, the fever which had prevailed some time in the *camp* at Colchester continued during October and November. An inquiry was instituted, *sanitary measures were probably adopted*, and no death from fever occured in camp *or town* during December, which was unusually healthy." Or, in other words, the Registrar-General asserts that sanitary measures are proved to be efficacious, because some sanitary measures were *probably* adopted! and that the measures adopted in the camp at Colchester had affected the number of cases of typhia in the town! The Registrar-General, in his eagerness to prove his own last crotchet, overlooks also the well known law that typhoid fevers do not rage in very cold weather; and that, therefore, their absence from the camp or town of Colchester in December proves absolutely nothing.

The subject of the high tides in England, and that of the recent severe floods in France, Austria, Spain, &c., is one of so great importance that it would hardly be advisable to treat it in a subsidiary manner; and, moreover, the authentic records connected with these events have not yet come before the public. We may revert to this subject on some future occasion, for the great modifications in the hydrographical conditions of our country which must ensue from the improvement in the surface drainage, and the regularization of the navigable rivers confer a degree of actual interest upon the inquiry to all who may be concerned in engineering operations.

Two rather curious events connected with the imperial and parochial taxation question have recently occurred, to which it may be desirable to call attention. The first is the decision of the Greenwich Magistrate rendering the Great Eastern liable to the poor-rates, on account of its having been moored to a wharf at Rotherhithe; and, we must say, that this decision seems to us to be a most unfair extension of the rights of the parochial authorities. The second is the claim of the land and building societies to a continued exemption from taxation, on account of transfers of land, as proposed to be established by the present Chancellor of the Exchequer. Admitting, as we do, many of the moral and social advantages produced by these societies, we cannot but regard any exemption from the laws of the land as a mistake, if not even as a positive injustice. The real remedy for the oppressive character of our modern taxation lies in the severe controul of the public expenditure; and the friends of the classes it is desired to serve, by the encouragement of Building Societies, would do more real good by checking the constant increase of the Civil service especially, than they possibly could do by withdrawing their clients from the necessity for contributing their fair share to the national Exchequer.

The writer of the money articles of the *Times* has lately displayed a great amount of virtuous indignation against the Railway Directors' Association, on account of their attempts to secure powers to alter the limits of charge imposed by the original Acts of Parliament establishing the various Railway Companies. It may seriously be questioned whether the united body of Directors be really wise in the course they have adopted in this matter; and, for our own parts, we are convinced that the interests of the shareholders in these concerns would be advanced by a lowering, rather than by a raising, of the tariffs. But this is a question to be left to the various parties interested; and, really the Railway Companies have been so shamefully robbed by the public, and by public authorities, in every possible manner, that we can easily understand that it may frequently be necessary for them to seek for a relaxation from the conditions of their original bargains. Even now, a day hardly passes without the occurrence of some attempt to extort more money from Railway, Gas, and Water Companies, under pretext of parochial wants; and, in face of these constantly augmenting charges, there seems to be no defence but in the power on the part of the Companies to increase their tolls. At the same time, we must add, that we quite agree with the writer in question, that it would be very desirable to establish some description of superintendence on the part of the commercial classes over the measures brought before Parliament, whether in the shape of public, or of private bills. At the present day, emphatically, the property of no person is safe from the crotchets of interested, or theoretical dabblers in legislation; and, if the trading classes be exposed to new burthens, through the tampering of railway officials with their parliamentary powers, they may be still more seriously affected by such measures as those which are from time to time presented by the Social Science-mongers. The tale of the enactment of a stringent Nuisances' Removal Act, under the name of the Smoke Nuisance Abatement Act, ought to be ever present to our commercial classes; and, even more seriously than in the case of the Railway Directors' Association Bill, this tale ought to demonstrate the necessity for the establishment of some association whose object should be to perform, for the interests of trade, the functions discharged by the Remembrancer of the City of London for his clients.

In the history of the technical details of the arts and sciences we usually consider, the last fortnight has produced little novelty. There has been an unfortunate rupture of one of the mains of the Glasgow Water-Works, and a great deal of mischief has thus been effected in parts of that town. Such accidents are, perhaps, almost inevitable in a work of this magnitude, and at present no blame is said to be attached to any of the parties connected with them. The Act for Regulating the Measures for the Sale of Gas seems to have come to a dead lock, and thus, again, to furnish an illustration of the necessity of some supervision on the part of practical men of the attempts of Parliament to interfere in technical operations. Mr. Hughes, we observe, not content with the mischief he has done by raising a storm against the gas companies of the metropolis, is about to commence a similar campaign against the Water Companies; and he has been circulating, in quarters from which he was tolerably sure of meeting with support, a list of questions for the purpose of proving that the constant service ought to be introduced in London. This agitation is, after all, simply mischievous; for, as the expense of the change from the intermittent to the constant service will fall on the tenants, it is tolerably certain that it will never be effected. To raise the question, then, can do no good; but it may rouse much unpleasant feeling between the public and the Water Companies, who certainly have discharged their duties nobly. At the Society of Arts, we would also add, a vigorous, but unfortunately a very unpleasantly personal, discussion lately took place on the occasion of reading a paper by Mr. Mechi on the results of sewerage irrigation. Leaving this personality aside, it seems to be, at present, the opinion of the majority of those who took part in the debate, that the wisest course to be adopted for the disposal of town sewerage was to employ it as a means of irrigation; but all parties seem to admit that the

success of even this process must depend on its being economically carried into effect. The hose and jet system of distribution was stigmatized as having proved an utter failure, notwithstanding the favourable conditions under which it has hitherto been applied.

There was an announcement in one of the recent London papers to the effect that the beautiful estate, known as Lord Holland's Park, was likely to be converted into building land, and that this green spot was shortly to be absorbed into the constantly-extending hive of London. Where is this town to stop? Are we to lose thus gradually all the fresh bits of nature around us, and to change groves of trees for groves of chimney pots? Utilitarian though we plead guilty to being, we cannot but regret thus to lose one of the lobes of the lungs of London; for such, indeed, this park was, in the heart of the suburbs of Bayswater, Notting Hill, and Kensington. And then that fine old Elizabethan house! Must that, too, make way for Paradise Rows, or for any reproductions of the wretched Street architecture of Tyburnia, or of Kensington Gore?

Circular to Gas Companies.

The manufacturers of gas-meters, whose interests are seriously prejudiced by the delay which has taken place in providing such models of gasholders as can be used in testing the measurement and registration of meters, have held a meeting, at which the principal firms were represented, and have passed resolutions expressing, in strong language, their opinions on the unsatisfactory manner in which the requirements of the Act for regulating measures used in sales of gas have been attempted to be carried out. They have since had interviews with the authorities of the Treasury, and with the President of the Board of Trade, in the presence of the Astronomer Royal, the proceedings at which are fully reported in another column of the JOURNAL. Mr. Marriott, the Parliamentary agent who drew the bill, has also drawn up a reply to the report of the Astronomer Royal; and a second meeting of the meter manufacturers was held yesterday, at which resolutions were passed which will be found in our advertising columns,

The Circumlocution Office has, indeed, had its perfect work. It has not only gone the way not to do it, but it has exhibited the mode by which that end has been successfully attained: and has, furthermore, laid down the rules whereby a similar object may be easily accomplished in all time to come. The report of the Astronomer Royal "On the instrumental equipments of the Exchequer Office of weights and measures, as regards the means of preventing fraud in the sale of gas to the public," &c., indicates clearly the source whence it springs, for the stamp of the Circumlocution Office is too strongly impressed to be mistakeable. The report is nearly equally divided between the consideration of the measuring instruments of capacity, and the "further enactments which appear to be necessary for the examination of gas-meters;" the latter alluding more particularly to the indices. We shall confine our present remarks to the first portion, which supplies ample food for comment.

We must premise by stating that, in the observations we feel it our duty to make on this report, we have no desire to derogate from the high position which the Astronomer Royal holds in the scientific world; but it is an established fact that when scientific men, however eminent, descend into "the domain of practice," they frequently commit more blunders than those who have no science to guide them; it may be no disparagement, therefore, of the Astronomer Royal to say that he has proved, in this instance, no exception to the rule. Such a matter, as we have before observed, ought to have been entrusted to those who are practically acquainted with gas-meters, and with the requirements to render them accurate measurers. What we blame the Astronomer Royal for, is that, in his ignorance of practical details and of technical terms, he has assumed others to be more ignorant than himself, and has presumed to dictate where he should have submitted to learn. He seems to have laboured under the mistake that the Act of Parliament was drawn up by persons who knew nothing about the apparatus employed in the measurement of gas, and being himself not practically familiar with the instrument, with all its appliances, which is known by every one concerned in the measurement of gas as a "gasholder," he treats it merely and literally as a holder of gas, and thinks the term may, therefore, be equally well applied to a bottle, or to a tin case, or to any other air-tight vessel.

Nothing could well be more clear and specific than the words of the Act of Parliament on this subject. The third section directs that, "within three months next after the passing of this Act, models of gasholders measuring the said cubic foot, and such multiples and decimal parts of the said cubic foot as the Lord High Treasurer or the Commissioners of Her Majesty's Treasury of the United Kingdom shall judge expedient, shall be carefully made, with proper balances, indices, and apparatus for testing the measurement and registration of meters," &c. If there be a fault in the phraseology, it is too copious, for the term "gasholders" would of itself have implied that they should be furnished with the proper balances and indices. It is really marvellous how it is possible seriously to suppose that a vessel without moveable parts, without division into fractional portions of a cubic foot, without any counterpoises, without any indices, and without any "apparatus for testing the measurement and registration of meters," can be such a "gasholder" as specified in the Act. Were it not that the circumstances precluded such a supposition, we should be induced to think that the deposit of the bottle and attached immovable metal case at the Exchequer-Office were intended for a practical joke. As it is, we are compelled to believe that the Astronomer Royal is in earnest in supposing that, having made a bottle to hold a cubic foot of water, and having obtained a vessel into which to empty it, he has fulfilled all the provisions of the Act of Parliament by merely calling a vessel that holds gas the required "gasholder."

There are some things so monstrously absurd that it is difficult for the imagination to find a parallel. To give a stone, when asked for bread, is usually considered the *ne plus ultra* of incongruity; but the Astronomer Royal goes far beyond that. He not only gives a stone when asked to give bread, but he insists that the stone is the thing asked for, and that "stone" means "bread," and should be taken as such. If this variation in the meaning of words be permitted, there can be no limits to changes in the English language; for, with equal propriety, gas might be called coal, or the sun a candle; and some persons might be mad enough to call the Circumlocution-Office a place of business.

It is amazing to those who have been accustomed to the use of gasholders, to hear the name they have always called them mentioned as "a parliamentary term," "the application of which is not strictly defined." The term is as well established as that of "thermometer," and the purpose to which it is to be applied "for testing the measurement and registration of meters," seems to be as clearly defined as words can define it; and yet we find that, in consequence of assumed uncertainty in the name and in the uses of the instrument, it is proposed to apply the term "gasholder" to a very different kind of instrument, which, according to the Astronomer Royal's own account of it, is "competent, *though not conveniently applicable* to the measure of any amount of air or gas."

Having, by some extraordinary process of reasoning, determined that the thing to be deposited at the Exchequer Office was a rigid metal case, capable of holding gas, but not conveniently applicable as a measure, it followed "logically" that, as the metal case was not a measuring instrument, "no indices or other apparatus are required;" and as there is an excellent pair of scales at the Exchequer Office, the report tells us that "no provision of a 'balance' was necessary." A more complete perversion of the meaning of words was scarcely ever known. The Act of Parliament expressly requires that the gasholders must be provided with proper *balances;* meaning, of course, exact counterpoises of the inverted suspended cover of the instrument, as all gasholders have; and we are gravely told in the report that such "balances" need not to be provided, because there is an "excellent balance" at the Exchequer Office! It is a very good pun on the word, if so intended, and is not a whit less absurd than to say that there are no balances necessary for the gasholders, because there is a good *balance* in the Exchequer accounts.

The reasons assigned why the metal case first called a transferrer should "be accepted as the true and proper gasholder contemplated by the Act of Parliament," are not much more cogent than the reason for dispensing with the balances. They are, briefly—1. That, "by making use of the graduations *in other instruments*," it may be *in*conveniently applied to measure the fractional parts of a cubic foot; 2. That the instrument is indivisible, and easily portable; and, 3. Because the more convenient instrument for measuring gas is not portable. That is to say—because the required gasholder for testing the

measurement and registration of meters is not portable, another instrument that will not measure, is to be substituted for it, and "accepted as the true and proper gasholder." But the Astronomer-Royal is wrong in his premises. Real gasholders, capable of measuring gas, *are* portable. One of them, holding 10 cubic feet, has been sent to the Exchequer Office to prove the fact. Of course, they require proper care in packing and in carriage, as all hollow vessels do—for even the portable cubic foot transferrer would be in danger of injury, unless properly protected, whilst carried from place to place.

The third section of the Act expressly declares that the models of gasholders shall be capable of measuring multiples and decimal parts of a cubic foot. The Lord High Treasurer, or the Commissioners of Her Majesty's Treasury, are allowed to exercise their judgment in determining the *number* of multiples and the *proportion* of decimal parts, but it is distinctly provided that there must be *some* multiples and decimal parts; nevertheless, the Astronomer-Royal says: "After careful consideration, I state to their lordships my opinion that no such multiples, or decimal parts, are required;" and he afterwards adds, "the sub-division of the cubic foot into decimal parts will be far more conveniently effected on the derived or compared instruments." These "derived" instruments are, in fact, the true gasholders. It is admitted to be indispensable that the instrument employed for "the actual testing of the gas passing through the meter" should be duly "recognized," though not by its right name. We are informed, indeed, that it has "frequently been called a gasholder," but that error is no longer to be tolerated; the "accepted" gasholder does not measure gas, and this actual testing instrument is henceforth to be called a "gas measurer." Some doubt, we imagine, must have crossed the mind of the Astronomer Royal, when directing how the "gas measurer" should be provided with indices, balances, and proper apparatus for testing the measurement and registration of gas, whether that instrument, so correctly described in the Act, was not the veritable gasholder contemplated by Parliament. But the doubt, if it arose, was not allowed to disturb the previous conclusion. The upshot of the whole business, as gathered from the report, is, that the work given to the Circumlocution Office to do, they have not done; but they have shown how not to do it by endeavouring to throw the burthen on the shoulders of some wandering philosopher, and by calling things by their wrong names.

A more careful perusal of Mr. Hills' patent for the purification of gas by oxide of iron (as modified by his disclaimer), than we had given to it when we last noticed the subject, has confirmed our first impression that the recent judgment of the Court of Exchequer secures to him, during his unexpired term, the exclusive right to the revivification of all oxides of iron used in the purification of gas while that judgment remains unreversed. It was argued that, as the revivification was an operation of nature well known at the time he took out his patent, it could not be made the subject of a patent, but the judges unanimously reject this hypothesis, and affirm that a novel application of such an operation to a particular purpose is patentable, and that Mr. Hills' claim, in this respect, is valid. One of the judges was, however, of opinion that a new trial ought to be granted upon the point as to whether Mr. Hills was the first inventor in this country; but, as the majority of them took a contrary view, that question cannot be again raised, except by an action commenced *de novo* against another alleged infringer, or by the issue of a writ of *scire facias* for the repeal of the patent. It is not probable that the parties will be disposed to adopt either of these courses, if Mr. Hills is reasonable in his demands, and is content with a fair remuneration for the use of his process. His monopoly has only 3½ years to run, and there can be no doubt he will gain more by liberally treating those who are compelled to use his process, than by pursuing an exacting policy.

The Metropolitan gas question remains in much the same state as when our last number was issued. A draft of the proposed Bill has been handed by the agent of the delegates to the agent of the gas companies under a pledge that its provisions shall not be made public, but it is doubtful whether any substantial progress has been made towards an amicable settlement or the points still in dispute. The subject was mentioned by Sir John Shelley at the last meeting of the St. George's, Hanover Square District Board, of which he is a member, when the honourable baronet is represented to have stated that our report of the negotiations and our remarks thereon, were "exceedingly unfair." Sir John, at the same time, admitted that "the whole question was reduced to two or three points of disagreement, namely, *illuminating power*, *pressure*, and *price*" and we apprehend that a few days will show that the points to be settled have been reduced within even narrower limits.

Correspondence.

A COMEDY OF ERRORS.

"One of these men is Genius to the other."
Comedy of Errors, Act v., scene 1.

SIR,—By a most extraordinary coincidence, I find that two gentlemen have a common, and yet an uncommon, name. I allude to the two individuals who bear the name of S. Squire Baxter—one the author of a paper read at the meeting of the Society of Arts, on the 22nd; and the other the writer of a letter dated the 28th of February, and published in the last number of the journal of that society.

I am perfectly well aware that some thoughtless people labour under the delusion that the two Squire Baxters are one and the same person. With third persons the mistake is a very natural one, but it is truly extraordinary that the writer of the letter should himself be a victim of the same delusion concerning his own personal identity. He says, "I was unavoidably absent from the reading of MY paper at the meeting of the 22nd." I know of only one parallel case, that of a poor compatriot of my own, who, under the pressure of deep feelings, sings, "Shure, I'm not myself at all."

Whether either of the gentlemen is Mr. S. Squire Baxter, the secretary of the Lime-Light Company, or whether either is in any way connected with Messrs. Baxter, Rose, and Norton, its solicitors, I cannot take on me to say; but that the author of the letter cannot, by any possibility, be the author of the paper, I think I can demonstrate as clearly as that one and one make two.

Before I enter upon the points of difference between them, I think that it is only a matter of simple justice to Mr. Renton to state that the former has been guilty of the most flagrant plagiarism, having, without any acknowledgment whatever, coolly imported into his paper, *ipsissimis verbis*, nearly the whole of Mr. Renton's report, simply adding some introductory paragraphs, which only deformed the original, as "gipsies do stolen children to make them pass for their own." It was not just to Mr. Renton, any more than it was respectful to the society, to lay at their door the offspring of his brain under another's name, and then to run away, leaving it to be examined by an uncharitable audience, when neither the real father, nor the step-father was present to protect the little innocent from many a harsh tongue, and many a cruel assault.

If you permit me, I will now endeavour to point out some of the most striking and essential differences which prove incontestably the duality of the two Squire Baxters; and, for the sake of distinction, I propose to call the appropriator of the paper, Baxter the first, and the author of the letter, Baxter the second.

1. The first Mr. Baxter is as remarkably ignorant on the subject of which he treats, as the second "of that ilk" is well-informed. A farthing candle to a lime light is the ratio of their knowledge. As an example of the mistakes the first falls into, when he strays away from the text of Mr. Renton's report, I may mention that in his prolegomena, he undertakes to give us the chronology of artificial illumination, and informs us that oil lamps came after candles, and that the Bude light was anterior to coal gas. I cannot refrain from giving one extract to enable the reader to judge how totally unqualified this writer is to deal with the comparative cost of the various methods of illumination:—

> It has generally been found (though it is not strictly true as a law), that the best light is the cheapest, the best and cheapest material giving the greatest amount of light for a given cost. Thus, for instance, stearine is a better and cheaper light than its equivalent in tallow candles, and wax than its equivalent in stearine.

It is scarcely necessary to say that the cost of light from these sources is in precisely the reverse order, wax being dearer than stearine, and stearine than tallow. For the same amount of light from the three sources, the cost for tallow is 10, for stearine 16, and for wax 26;* and Mr. Rutter, a most competent authority on the subject, tells us that tallow candles will give as much light for 10d. as wax for 2s. 4d. On the other hand, the amount of knowledge which Mr. Baxter the second possesses offers a remarkable contrast to the ignorance of his namesake. On this subject, we can have no higher authority than his own, and he says, "I am in possession of much valuable information and experience"—so valuable, however, that "it is inconsistent with sound commercial principles to make it public." In this, indeed, he only shows his common sense, provided he can get paid for his valuable information at the same rate as the patentees of the lime-holder are to be remunerated for their pretty little *contrivance*.

Indeed, the second Mr. Baxter is not only learned, but has a great horror of unlearned people. He cannot abide people as ignorant as the first, for he weightily tells us "how careful professional men (especially) should be in putting forth statements as

* Ronalds and Richardson's "Chemical Technology," page 688.

facts, which after all are but opinions based on very questionable data, and insufficient knowledge of the subject, often tending greatly to mislead the public.

2. It is perfectly clear that the first Mr. Baxter could never have heard of the baryta process for producing oxygen, as he nowhere mentions it in his paper, although, in a justifiable anxiety to discover sources for this gas, he is carried so far in his quest as to speak of a probability of producing it economically from the peroxide of mercury, a raw material which is probably not worth more than £800. a ton (!!!). On the other hand, the second Dromio assures us that he "was long ago cognizant of the baryta process."

3. In the paper read on the 22nd, we find it distinctly stated, that after the peroxide of manganese has yielded 11 per cent. of oxygen, the residuum, the "*deutoxide or sesquioxide* of manganese may be drawn from the retort, and, if thrown into water, or exposed at a high temperature to the action of the atmosphere, it will attract oxygen with great avidity; and thus this refuse becomes revivified, or resumes its former state of *peroxide*, fitting it by this operation for a repetition of the distillatory process."

Now, it would be exceedingly difficult to compress into so small a compass so great a number of gross mistakes as are contained in the above short extract. In the first place, the writer is evidently ignorant of the fact, that the *peroxide and the deutoxide*, one of which, he says, may be converted into the other, are both *precisely the same substance;* that is to say, one atom of manganese united with two of oxygen (or $Mn\ O_2$). In the next place, he thinks that the deutoxide and the sesquioxide are the same, although the latter contains only one equivalent and a half of oxygen, being ($M\ n_2\ O_3$). In the next, place the combination drawn from the retort, after expelling the oxygen, is not, as he alleges, either of these compounds, but a complex oxide (analogous to the black magnetic oxide of iron), consisting of three atoms of manganese, and four of oxygen (or $M\ n_3\ O_4$)*. And, finally, what is of more importance than all, the residuum does *not* attract oxygen, or become revivified by the water, or by the atmosphere. Now it is a piece of very "moonshine madness," to consider that a gentleman possessing so much "information, &c.," as the second Mr. Squire Baxter, could stamp, with the weight of his name, a passage showing such crass and concentrated ignorance of the principles, and even of the nomenclature of chemistry. Every chemist who spoke at the meeting of the society, declared emphatically that the residual oxide, could not be so revivified—an opinion which the second Mr. Baxter shares, or else he would certainly have expressed his dissent from them on a point so important for his own case.

4. The next point of difference which shows the impossibility of the two Dromios being the same person, is one of great importance, the first telling us that the price of oxygen will be "merely nominal," while the second estimates its price at £3. 2s. 6d. per 1000 cubic feet!!!

5. Another matter, upon which those two authorities totally dissent, is the cost of light given by a mixture of coal gas and oxygen, playing upon a cylinder of lime. The first tells us in his tabular statement of comparative cost (which you have already published in Mr. Renton's report, and in my letter) that the lime-light is cheaper than coal gas only in the ratio of 1 to 1·88, while the second Baxter alleges that it is cheaper in the ratio of 1 to 6·70. This is a very wide difference, the estimate of one being more than $3\frac{1}{2}$ times that of the other. To put the question in a point of view very plain to your practical readers, I may suppose that a town requires to be lighted with coal gas. One engineer estimates that it can be supplied at 5s. per 1000 feet, while another reports that it cannot be sold at less than 17s. 6d. Can there be any person so utterly devoid of reason as to believe that that those two engineers, both giving written reports within the same week, are one and the same person? and yet this is what I am asked to take for granted by the idiots who assert that the two Squire Baxters are one individual!!

6. But a consequence still more extraordinary results from the combination of the two last statements, viz., the gentleman whose oxygen is produced at a cost "*merely nominal*," alleges that the light will cost $3\frac{1}{2}$ times as much as the other, whose gas costs him £3. 2s. 6d. per 1000!!!

7. The next is a question of volume. The adoptive father of Mr. Reton's report states that $6\frac{1}{2}$ cubic feet of gas gave a light exceeding 20 candles, or say 1/38th part of the lime light of 758 candles; it would therefore take 38 such gas jets to give as much illuminating power as the lime light referred to. The consumption of coal gas would, therefore, be $38 \times 6\frac{1}{2} = 247$ cubic feet, or $16\frac{1}{2}$ times 15 feet—the volume of mixed gases consumed by the lime-light. But Mr. Baxter the second, states that the volume of coal gas necessary to produce an equal amount of light with the mixed gases playing on lime is in the ratio of 50 to 1, instead of 16 to 1. Surely, unless any one can demonstrate to me that 16 and 50 are the same number, he may as well abandon the equally idle effort to prove to me that Baxter of the 22d could be Baxter of the 28th.

8. We now come to a question of photometry. Baxter the first tells us that 15 feet of the mixed oxygen and coal gas produced a light equal to 758 wax candles, being at the rate of 50 candles per cubic foot; while the second assures us that 35 cubic feet give a light equal to 400 gas jets, each consuming 5 feet an hour; that is to say, equal to 6000 wax candles, or 171 candles per cubic foot.*

This discrepancy might in some degree be accounted for by the principle I explained in my last letter, viz., that the quantity of light increases in a larger ratio than the consumption of the light-giving material, if the 35 feet were all consumed in one light; but in reality there were employed 5 jets of the combined gases, playing on 5 distinct like cylinders; in point of fact, 5 distinct lime-lights. Each of these, therefore, consumed only 7 feet instead of 15 feet, as in the former instance; thus showing that, contrary to all previous experiments, a less consumption of gas, in the ratio of 1 to 2, produced a greater illuminating power in the ratio of 7 to 2.

Another logical consequence of the statements made by the two Squire Baxters, shows how utterly ridiculous is the supposition of those people who entertain the wild theory that there is only one Baxter. By the experiments last quoted, we find that each of the cylinders consumed 7 cubic feet of gas, and therefore gave a light equal to 1200 candles; while, by the tabular statement, 15 feet of the same gas gave a light of only 758 candles. If both statements be true, a great principle would be established, which need only be carried a little further to produce results of the highest value. We find that, by reducing the consumption of gas from 15 to 7 feet, the absolute amount of light given is increased from 758 candles to 1200 candles. All that is necessary, therefore, to increase the quantity of light is to diminish the quantity of gas. Therefore, a burner consuming an infinitely small quantity, would produce an infinitely great light; so that no gas at all would afford a dazzling amount of illumination, perfectly intolerable to the human eye!!!

Now, is it not utterly incredible that the Mr. Squire Baxter, who lectures professional men, telling them about being "careful of putting forward statements as facts," about "questionable data," about "insufficient knowledge," &c. &c., could give his authority for both those statements? He, therefore, cannot be the two Baxters; and not being one, is therefore the other—*quod erat demonstrandum*.

I hope I have now satisfactorily bisected Baxter; and, before the drop-scene falls upon this farce, I have only to say, by way of epilogue, that I am sure *Dromio of Ephesus* will loudly applaud me for preventing the public from confusing him with *Dromio of Syracuse*, and that the Baxter who "*is genius* to the other" will feel deeply grateful to me for distinguishing him from his unillumined namesake.

As I have pen in hand, I use the opportunity of mentioning a circumstance which otherwise I should not have taken the trouble to notice. I allude to the wholesale manner in which Dr. Letheby, in his speech on the 22nd, appropriated, without any acknowledgment, my letter, published on the 14th, which he *must* have read, as he quotes figures of mine which he could have found nowhere else. There is not a single line in the report of this speech which is not taken (with slight modifications) from me, with the exception of a statement relative to the sensitiveness of his own retina. I regret that this sensitiveness of his nervous, is not extended to his moral, system, for then the great chemist to the Corporation of London might feel some compunction at stripping a humble provincial of the fruits of his little industry. If the results of my calculations were worth borrowing, they were worth acknowledging.

I cannot help remarking that, although Mr. Michiels has been frequently spoken of, in reference to obtaining oxygen from hydrate of baryta, the name of Boussingault, the inventor of the process, has never once been mentioned.

DENNY LANE.

72, *South Mall, Cork, March* 7, 1860.

* Sir Robert Kane's "Chemistry." Second Edition, p. 333.

* For the reasons given in my former letter, I assume, with Mr. Renton, that the coal gas is of 15-candle power.

Register of New Patents.

1901.—HYAM JACOB HYAMS, of Holywell Street, Westminster, gas-meter maker, for "*Improvements in the construction of wet gas-meters.*" Patent dated Aug. 18, 1859.

This invention of improvements in the construction of wet gas-meters relates to improvements in the means of maintaining the water-level in wet meters, and thereby insuring accurate measurement of the gas passed through the meter.

In carrying out this invention, the waste-box is used as a reservoir for supplying water to a supplementary cistern, vessel, or chamber, which maintains the proper water-line or level, and thereby compensates for the loss of water by evaporation. The water to supply the supplementary cistern is raised from the waste-water reservoir to the supplementary cistern or chamber, placed at a higher elevation, by means of rotating buckets, or by a reciprocating trough or troughs, or other equivalent lifting apparatus. When rotating buckets are used (which is the plan preferred) they are attached to the end of arms, which are mounted on the axle of the rotating measuring-drum; thus the buckets are actuated without the intervention of gearing. And so, also, when adopting the system of reciprocating troughs (which it is preferred to employ in pairs), they are worked by the direct action of a crank or arm on the drum-axle. For adjusting the water-level in the measuring-chamber, in which the measuring-drum revolves, a sliding-gate is formed in the supplementary chamber or cistern, and which sliding-gate, according to its adjusted height, gauges the maximum level of the water in the chamber.

The water to compensate for evaporation may also be lifted from the waste-water reservoir into the supplementary cistern, by means of a rotating helical tube; or an archimedean screw may be itself the drum-axle. In this latter case, the drum will be set at an inclination, instead of being mounted on a horizontal axle; and the axle of the inclined drum will be inserted in a fixed pipe, which forms a channel for the passage of the gas from the supply-pipe to the drum. Thus, simultaneously with the rotation of the drum, will the small supply of water required to compensate for the loss by evaporation be lifted from the waste-water box, and be discharged into the supplementary cistern, which forms the water-level vessel or chamber.

In order to prevent the level of the water from being tampered with, a clack-valve is adapted to the supply and overflow-pipe, so as to control the flow of water; and, when suction or force is applied to such pipes, the clack-valve will close the aperture of the same, and will cut off access to the interior of the meter.

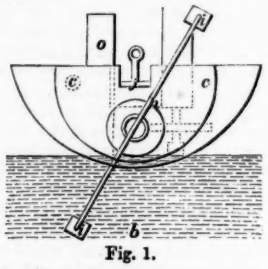


Fig. 1.

Fig. 1 is a front elevation of the form of the improved apparatus adapted to a wet meter, the front part of the casing being removed, in order that the internal arrangements may be more clearly shown: *b* is the waste-water cistern, which forms a reservoir to supply the small semi-circular supplemental cistern, chamber, or vessel, *c*, above; the axle of the measuring-drum is not shown in the drawing, but is contained in the case, as usual. An endless screw or snail, fixed on the axle, gears into and drives a horizontal worm-wheel, whereby the indicating apparatus is actuated in the usual manner. A short shaft is jointed to the end of the shaft, on which the measuring-chamber is mounted, and, in fact, forms a continuation of the shaft, and consequently rotates therewith. This short shaft passes through a stuffing-box, fixed to the front of the supplementary cistern or chamber, *c*. The short shaft carries at its outer end two arms, *h*, at the extremities of which are fixed the buckets, or small vessels, *i i*. The ends of these arms are cranked or bent at right angles, so that as the shafts, together with the measuring-chamber, rotate, they will carry round the arms in front of the supplementary chamber or vessel, *c*; and the vessels or buckets, *i i*, at the end of the arms, will be thereby carried over the open top of the vessel, *c*, and in so doing they will discharge into that vessel the water they have taken up, by dipping into the waste water at the bottom of the vessel, *b*.

It will, of course, be understood that a supply of water should always be kept in the waste-water box, or reservoir, so that the buckets, as they rotate, may be enabled continually to take up a small quantity of water and discharge it into the vessel, *c*, from whence it will flow into the measuring-chamber, whereby the water in the latter is always kept at the proper level.

As the buckets are always raising and delivering water into the supplementary cistern when the meter is in action, it will be easily understood that there will be an excessive supply of water to the vessel, *c*, and the measuring-chamber which communicates with it. This excessive supply will not, however, interfere with the proper action of the meter, as any excess of water discharged into the supplementary cistern will run over the adjustable water-gate, *j*, and fall back into the waste-water reservoir, to be again lifted up by the buckets. The water-gate is arranged to move vertically, in guides adapted to the vessel, *c*, so that, by raising or lowering this gate, the level of the water in that vessel, and, consequently, in the measuring-chamber that communicates therewith, may be regulated with accuracy. Water is supplied to the meter through a pipe, and is conducted by this pipe into the measuring-chamber, from whence, when the water has risen therein to a proper level, the surplus will flow out through an aperture into the vessel, *c*, until the latter is also filled. The water will then run over the water-gate, *j*, and fall into the waste-water reservoir, *b*, which may be provided with a waste opening, as usual, to allow the water to run off when it reaches a certain level in the vessel, *b*.

The gas enters the meter through a pipe, and passes into a small chamber, in which is an opening, provided with a valve attached to the upper end of the stem of a float, which floats on the water in the waste-water reservoir, so that when the water in this reservoir sinks below a given level, the valve at the upper end of the stem of the float will drop on to its seat until it is again raised to supply the meter with more water.

The gas, having passed into the vessel *b*, fills this space, and then passes down the pipe *o*, into the measuring-chamber. This pipe *o*, extends down through the bottom of the vessel *c*, and is open at its lower extremity; and the gas passes from the pipe *o*, through a branch pipe. It will thus be evident that, if too much water be supplied to the meter, so as to raise the level of the water in the vessel *b*, it will run up the pipe *o*, and ultimately close the opening of the branch pipe that conducts the gas from the pipe *o*, into the measuring-chamber. The action of the meter will, therefore, be stopped until the surplus water be drawn off, so as to open a passage to the gas. The float, whereby the inlet-valve is regulated may, if desired, be placed in the vessel *c*, instead of in the waste-water vessel, as shown in the drawing.

The gas, after having passed through the measuring-drum, and been measured, will issue therefrom, and escape from the meter through a pipe, as usual.

The water, on being poured into the pipe enters a small chamber or box, in which is a clack-valve, which is suspended immediately in front of the end of the pipe. The use of this valve is to prevent any water from being surreptitiously drawn out of the measuring-chamber; as, immediately such an operation is attempted by suction, the valve will fall against the end of the pipe, and by closing the same, will prevent the water from running out.

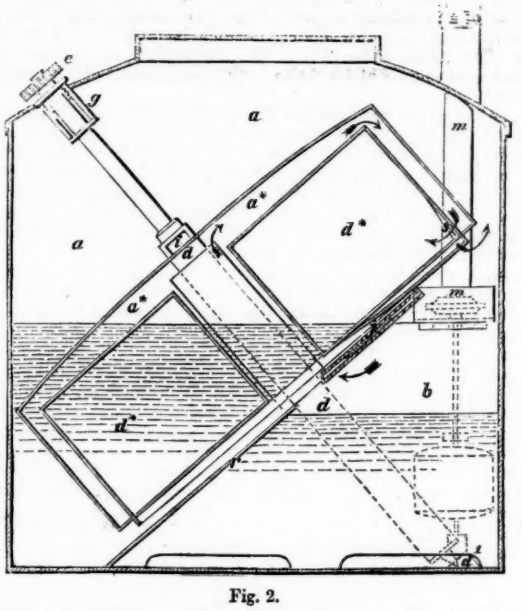


Fig. 2.

Fig. 2 is a transverse vertical section of the meter, from which it will be seen that the meter is divided into two parts by an inclined partition *r r*, which is provided with an adjustable water-gate, *j*, whereby the height of the water in the chamber, *a a*, may be regulated, as in the former instance. The hollow axle, *d*, of the measuring-drum *d**, is placed in an inclined position, its lower end being supported in a step, d_A, and its upper end passing through a stuffing-box, *g*. A toothed wheel, *e*, keyed to this axle, drives the indicating apparatus in the usual manner. The hollow axle is opened at its lower end, and is provided internally with an archimedian screw, which rotates with it, and in so doing conveys a small quantity of water up the screw, and delivers it through an aperture, *i*, into the open part, *a*, in which the measuring-drum rotates. It will be seen that, whenever the drum is in motion, the archimedian screw will raise a small quantity of water at each revolution, and will thereby constantly maintain the proper water level in the chamber, *a*; any excess being discharged over the water-gate into the waste-water reservoir.

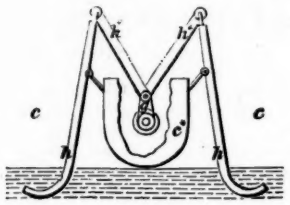


Fig. 3.

Fig. 3 is a sectional view of another modification, in which the supplementary cistern, *c**, is supplied with water from the waste-water reservoir, by means of reciprocating scoops, or bent pipes, connected to and actuated by a crank mounted on the end of the axle of the measuring-drum. *h h*, are the scoops or bent pipes, which are mounted on centres, fixed on the front of the supplementary cistern, *c**. The inner ends of these scoops or bent pipes are connected by means of the links or bars, *h* h**, to the crank, *g*, on the end of the axle. As, therefore, the axle and crank rotate, they will draw down the inner ends of the scoops, and raise up their outer ends; and as the outer ends of the scoops are bent, and thereby form a sort of bucket, it will be evident that, when they are depressed, as shown in the drawing, so as to bring their open ends below the surface of the water, a small quantity of water will run in; and, when the scoops are raised on their centres, the water contained therein will run out at the opposite ends of the pipes, and be discharged into the supplementary cistern or vessel, *c**.

In order to facilitate this discharge, and to make room for the end of the axle, and the crank, *g*, with the rods, *h**, a portion of the supplementary vessel or cistern, *c*, is made to project beyond the rest. The water will, therefore, run out of the scoops into this part of the cistern, and will thereby maintain the water-level therein, as well as in the measuring-chamber, which communicates with it.

It will be observed, that in all the arrangements above described for maintaining the water-level in the measuring part of the meter, the instruments or contrivances whereby this object is effected are connected directly with the axle of the measuring-drum, instead of being actuated by means of intermediate appliances, as has heretofore been the case.

The claim is for the means herein shown and described, of maintaining

the proper water-level in the measuring-chamber and supplementary cistern; and also the means shown and described of preventing the surreptitious abstraction from the meter of the water by suction, tilting, or otherwise.

PROVISIONAL PROTECTION

HAS BEEN GRANTED FOR THE UNDERMENTIONED INVENTIONS.

372.—JAMES WRIGHT, of 42, Bridge Street, Blackfriars, London, engineer, for "*Improvements in the construction of water-closets.*" Feb. 11, 1860.

426.—WILLIAM CLARK, of 53, Chancery Lane, London, engineer and patent agent, for "*Improvements in the manufacture of gas and in apparatus for the same.*" Feb. 16, 1860.

433.—JAMES GEORGE, of Birmingham, jeweller, for "*A new or improved method of suspending gas and other chandeliers.*" Feb. 17, 1860.

451.—MICHAEL HENRY, of 84, Fleet Street, London, patent agent, for "*Improvements in the production of gas for lighting and heating, and in apparatus employed therein.*" Feb. 18, 1860.

521.—THOMAS LAMBERT, of Short Street, New Cut, and OBED WAKEFIELD, of Union Place, Lambeth, London, for "*Improvements in steam and other valves and cocks.*" Feb. 25, 1860.

541.—JOHN ALLEN BASSETT, of Salem, Massachusetts, U.S.A., for "*Improvements in the manufacture of gas for illuminating and other purposes.*" Feb. 27, 1860.

549.—MAGNUS MANSON, of Edinburgh, gas-meter maker, for "*Improvements in gas-meters.*"

NOTICES HAVE BEEN GIVEN OF INTENTION TO PROCEED WITH THE UNDERMENTIONED INVENTIONS.

2512.—FREDERICK HALE HOLMES, of Northfleet, Kent, professor of natural philosophy, for "*Improvements in apparatus for transmitting light.*" Nov. 4, 1859.

2661.—JAMES FYFE, of Greenock, N.B., brassfounder, for "*Improvements in apparatus for regulating and adjusting the flow and pressure of liquids.*" Nov. 24, 1859.

232.—THOMAS WALKER, of Birmingham, engineer, for "*Improvements in means for cleansing sewage and other waters.*" Jan. 20, 1860.

Parliamentary Intelligence.

HOUSE OF LORDS.

MONDAY, MARCH 5.

(*Before Lord* LYVEDEN, *Chairman*, *Viscount* DUNGANNON, *Marquis of* LONDONDERRY, *Lord* SALTOUN, *and Viscount* MIDLETON.)

NORTH KENT WATER BILL.

Serjeant WRANGHAM appeared for the promoters, and Mr. ALEXANDER, Mr. TINDALL ATKINSON, and Mr. JOHNSON, for the several petitioners against the bill.

Serjeant WRANGHAM said he had the honour to appear in support of this bill, and the case seemed to him to be one of very great simplicity as to the larger portion of the scheme. Indeed, it was only objected to by the petitioners with regard to certain portions of the undertaking. The company proposed, as the preamble of the bill would have informed their lordships, to construct works to supply water in the towns of Dartford, Crayford, Bexley, Wickham, Erith, Plumstead, Woolwich, Charlton, Eltham, Chislehurst, Bromley, and Beckenham, in the county of Kent. The greater part of that district had at present no supply whatever from any other water-works. There was, as he should have presently to observe, a supply at Woolwich, Charlton, and Plumstead, but at the other places mentioned there was no other supply of water except that obtained from the wells of individual inhabitants. It was not necessary at this time of day to trouble their lordships with any remarks upon the necessity of an ample supply of water to such a district. The use of water had increased of late years, owing to the improved habits of the population of this country, to such an extent, as to be in itself a sufficient argument in support of any project for supplying that article in greater abundance, provided there was no objection to the scheme arising from extraneous circumstances. He had said that Woolwich, Plumstead, and Charlton, had a *quasi* supply of water at the present moment. It appeared that a company, called "The Kent Water-Works Company," was incorporated as far back as 1809, for the purpose of supplying the towns of Greenwich, Deptford, and other places; and the supply had been derived principally, and till lately exclusively, from the river Ravensbourne, at the side of which, at Deptford, the company's works were established. In 1811, the powers of this company were extended so as to include Woolwich, Plumstead, and Charlton; and, under the powers of that Act of 1811, they purchased certain springs of the town commissioners of Woolwich, which those commissioners had recently obtained from Sir Thomas Wilson, the lord of the manor of Charlton. But those springs had never been made available for the supply of water, and he believed that up to the present time the source of the company's supply was from the Ravensbourne, and from some wells sunk by the side of that river. The water of the Ravensbourne had become, as the committee would hear from the witnesses who would be called, utterly unfit for human beings to use.

The CHAIRMAN: Where is the Ravensbourne?

Serjeant WRANGHAM said it ran from Lewisham down to the Thames at Deptford Creek; and the increase of buildings on the banks which had taken place of late years, together with the generally improved system of house drainage which had been adopted in the locality, had caused a large quantity of sewerage matter to find its way into the stream, which had thereby become so polluted as to render it unfit for any domestic purpose. The Kent Company had in addition, as he had stated, some wells by the side of the river; and their reservoir was in Greenwich Park. But there was another company in a portion of the district covered by the present bill, called by contrast with the Kent Company, the "Plumstead, Woolwich, and Charlton Consumers' Pure Water Company," which was established at a later date. Some few years ago, the objectionable character of the water supplied by the Kent Company led to the formation of the second company, which he believed might, with more justice, be called the "Plumstead and Woolwich Impure Water Company." Certainly their water was not so good as to lead to its general adoption, and from that, or some other circumstance, a great deal of litigation had taken place, and the company were at present in that place where water companies were not very likely to flourish—the Court of Chancery. That company did not offer any opposition to the bill now before the committee, and, therefore, might be taken to admit that the supply of water to the district was not such as the inhabitants were entitled to expect. The only petitioners, in fact, were the Kent Water Company, which, after having been incorporated for fifty years, and having had possession of the springs at Charlton during that period, had not adopted the means which he considered were necessary to give their constituents a supply of pure water, although he believed that, since the present competitors had been in the field, they had commenced erecting works to render those springs available. As regarded the plan of the promoters, he might say that they proposed to include Dartford as the eastern extemity of their system. That town was in a peculiarly unhappy position, and, really, the case of Tantalus was the only parallel to their case. The Local Board of Health at Dartford, some years ago, finding the supply of water to the town very deficient, went to the expense of sinking large wells, erecting an engine-house and engine, and laying down pipes, for the purpose of giving an efficient supply to the inhabitants; but, unfortunately, some change came over the spirit of the ratepayers, and, the constitution of the local board having been altered, the whole plan was stopped, the supply of water never came, and the contractor was never paid. By way of revenge, or to recoup himself for the outlay, the contractor seized the engine, which was sold under an execution, and the ratepayers, after all their expenditure, were utterly unprovided with a supply of water. The promoters of the present scheme proposed to sink a large well, or sumpt, a short distance from Dartford, and to lay down a main to that town, when, no doubt, some arrangement would be come to between them and the Board of Health for the purchase of the pipes already laid down. From the pumping-station he had just referred to, the company's pipes would proceed for a distance of seven miles along the turnpike road, to a spot on the north side of Shooter's Hill, where there would be erected a reservoir, at a great height, to supply the other parts of the district. Indeed, that was the only spot where they could reach such an altitude as would enable them by gravitation to furnish the demands which would be made upon them. The height of that reservoir was 200 feet above Trinity high-water mark, and the reservoir there would give them the command of the whole district; and they would be able, should a fire take place in any of the extensive Government works at Woolwich, to afford an abundant supply in the briefest possible time. The population which the company, reckoning modestly, might fairly and confidently reckon upon supplying, was about 20,000; and, allowing 30 gallons per head per diem, which was a large and liberal calculation, would give a total quantity required of 600,000 gallons in the ordinary day; but, in order to provide for contingencies, the company had counted upon raising 660,000 gallons. The elevation of the reservoir, and the forcing along the pipes, would take a total lift of 325 feet; and he believed the calculation was, that to lift 660,000 gallons 325 feet in twelve hours, would take an engine-power of 92 horses, and accordingly that was the basis upon which their estimates were framed. The cost of the works had been taken at only £37,000, or, in exact figures, £36,802. Of course, they looked for other places in the district taking water from them, and, in that case, additional funds would be required. The estimated cost being £37,000, their capital was £40,000, in 4000 £10 shares, and they also took the usual loan power of £16,000, which would give them a disposable capital of £56,000. He had given the figures of expenditure from his brief; but he believed that the estimates had since been revised, and that the total outlay at present contemplated would not exceed £31,292. There were several petitions against the bill, but he believed there was no appearance upon them—certainly not in a hostile sense—with the exception of two, and those two might be considered as one—viz., the Kent Water-Works Company, who were the real opponents. This company objected to the promoters including Plumstead, Woolwich, and Charlton within the area of their supply, and also to the position of their reservoir. There was another petition subsidiary to that, signed by the ratepayers of the three places just mentioned; but he believed the total number of signatures, although each place was sufficiently populous, was sixteen—eleven of these being inhabitants of Woolwich, two of Charlton, and three of Plumstead. Now, it had been frequently a question before parliamentary committees in cases of this kind, whether a company already in existence in a district had any right to be heard against the preamble of the bill of a competing company, and there had been frequent decisions in this and in the other House, restricting the old company to clauses for the protection of their pipes. But he did not propose to take any objection to the *locus standi* of the petitioners against this bill, partly because he had no objection, except for the waste of time which it occasioned, that his learned friends on the other side should be allowed to make the best case they could before their lordships as to the treatment which the inhabitants of the district had received at their hands; for of one thing he was quite sure, that all the eloquence on behalf of the petitioners would never convince the committee that the waters of the Ravensbourne could be purified and made fit for use. And another reason why he would not object was, that the ratepayers, though few in number, and probably representing the Kent Company in another form, had an undoubted right to be heard; so that whether his learned friends appeared for the one or for the other was of little consequence, as the promoters did not wish that any portion of the case should be suppressed. Their lordships would bear in mind, however, that this opposition applied only to the supply to Woolwich, Charlton, and Plumstead, and that counsel on the other side had no footing in any other part of the district. It might be taken, indeed, that all the other places assented to the bill, and were anxious that the company should be established; and that the opposition was entirely confined to the old company, who dreaded the intrusion of a rival undertaking within their limits, and feared that, their monopoly being interfered with, their profits would be diminished. How far that might be a ground of opposition which would weigh with the committee, he was not prepared to say; but it was clear that they came forward only as rival tradesmen.

Lord DUNGANNON: Am I to understand that the ratepayers who have signed this petition are a part of the company?

Serjeant WRANGHAM said he meant to say that the petition, in all probability, was got up by the Kent Company, who knew the decisions by which rival companies were prevented from being heard, and who had taken care to provide another string to their bow, in case of their appearance as a company being objected to. That petition referred only to the position of the proposed reservoir, and, no doubt, the company knowing that no pressure of theirs would ever prevent the Woolwich and Plumstead people from getting a supply from it, were anxious to prevent its being erected there at all. He trusted their lordships would not sanction its removal, as it was by far the best site in the whole district for such an erection. There were certain other petitions from mill-owners and tenants upon the different streams, but he need not go into the allegations of those petitions, because he believed the parties were all settled with.

Mr. T. ATKINSON said he opposed for Mr. Swayson, who had large and

valuable bleaching-grounds in the neighbourhood, and to whom it would be positive ruin to have a large chimney erected there. He should either oppose the bill altogether, or require the insertion of a clause with a penalty which would amount to an absolute prohibition.

Rev. *W. Acworth*, M.A., examined by Mr. JOHNSON.

I am the vicar of Plumstead, which, at the last census, contained a population of about 8300. The increase of buildings and the augmentation of the Government works at Woolwich Arsenal have led to a considerable increase in the population, which, at the present time, is probably not less than 16,000. I know the whole of the district proposed to be supplied by the new company, and am in the habit of visiting among the poor in my own parish. The supply of water there is by no means sufficient. We consider the water from the Kent Company to be anything but good. There is another company, which was formed about five years ago for the supply of the district. That company have no Act of Parliament, and their affairs are now being wound up in the Court of Chancery. I think it would be of immense advantage to Plumstead and the neighbourhood to have an abundant supply of pure water. There are a great many parts in which at present there is no supply at all. In one place, called the Slad, I have seen scores of people getting their water from a puddle, and the washerwomen are continually complaining that they cannot wash their clothes properly, because they cannot get enough water.

Serjeant WRANGHAM said he was now in a position to inform their lordships that they would be relieved from the necessity of a protracted inquiry, as the Kent Company had come to an arrangement with the promoters, which was satisfactory to both parties. The Kent Company had agreed not to oppose the bill, on consideration of the promoters striking out the three places—Woolwich, Plumstead, and Charlton, which they had powers to supply.

Mr. ALEXANDER said his clients considered it a duty to themselves to petition against the bill, as they had spent large sums of money upon their works, and were at present under heavy contracts for the supply of water to the Government works, which had involved them in large expenses. They would have considered it a great hardship if their rights had been interfered with, and the promoters of the present bill had been permitted to come into competition with them, especially as they had never paid their proprietors more than 5 per cent., and, for thirty-five years, only 2 per cent. The promoters, however, having consented to strike out those places, they withdrew from the opposition.

The CHAIRMAN: That may be a very satisfactory arrangement for the two companies, but may not be so to the inhabitants.

Mr. ALEXANDER said, in reference to the quality of the water supplied by his clients, the Kent Company, he might state that it had been analyzed by Dr. Letheby, the sanitary officer of the City of London, who represented it in a most favourable point of view, the organic impurities being only 2 grains in a gallon.

Lord DUNGANNON: How are you going to supply the deficiency in this district?

Serjeant WRANGHAM said there was nothing to prevent the two companies coming to an arrangement for a supply from the proposed new reservoir.

Mr. ALEXANDER said the Kent Company were now engaged in making the Charlton springs available for an additional supply, and an engine-house was in course of erection for the purpose. He might also state, after what had been said by his learned friend, that the water from the Ravensbourne had not been used for a long time past, except in case of great emergency. The chief source of supply had been drawn from the chalk formation, and he should be able to show that they had the means of giving an abundant supply of great purity. He should also have shown, had not the opposition been withdrawn, that his company had been laying down pipes for supplying Plumstead.

Lord LONDONDERRY: Are we to understand that the deficiency of supply referred to has gone by now?

Mr. ALEXANDER said there was no doubt of it. He did not think the reverend gentleman who had been called as a witness spoke the sentiments of many persons in the district, as it was generally admitted that the supply was good at the present time. The Plumstead Company had sold their works to the Kent Company, and they were now in possession of them.

Joseph Gibbs, Esq., examined by Mr. JOHNSON.

I am a member of the Society of Civil Engineers, and have been largely engaged in the construction of hydraulic works, and in providing water supply for towns and suburban districts. I am well acquainted with the geological formation in the localities referred to in this bill. At the point where the pumping station is proposed to be erected, the level of the ground is entirely saturated with water—this is called the tidal water-line. The pumping-station is placed in the bed where the river Cray originally ran, and where the fissures in the chalk are unaccountably large, and from whence it will flow with great ease to the pumping station. We intend to sink a large sumpt, which is a well and a reservoir in combination. The water from thence will be carried to the town of Dartford, to supply the pipes already existing there. The other main will pass along the old Roman road, which, having no curves in it, is well adapted for laying water-pipes, and will extend to the north side of Shooter's Hill, where there is a natural valley in which two capacious reservoirs will be constructed. From that elevation of 220 feet we shall be able to supply all the surrounding district. The houses in that locality are rapidly extending, and the inhabitants are entirely destitute of water, except by sinking wells through the sand some hundred feet, and drawing their supply by bucket and rope. Another branch-main will be carried to Chislehurst, Bromley, Beckenham, and Eltham, where the soil is very dry, the rain sinking through directly, and where, consequently, the supply at present is very short.

By the COMMITTEE: We shall have abundance of water for the ordinary supply of all this district, and, in case of emergency, can furnish any quantity. We included originally three rivers in our scheme to supply 10,000,000 gallons per day, but we should only take 1,000,000 at present. The only stream we now include we shall rarely want, as we shall take the subterranean waters. It is a water-bearing district, and we are below the water-level. By sinking the sumpt, we shall have more than enough for all the present population. The water is not affected by the tide in the river; no part of the supply will be from the river proper, but from the valley of the Cray.

By Mr. JOHNSON: Supposing the sinking of the sumpt should be insufficient, we shall have drifts or adits, which will go under the bed of the river, but not communicating with it, as they will be sixty feet below the bed, and in that way we shall catch the springs at various points. The population we shall supply is 20,000, which, at 30 gallons per head per day, will give the total quantity required 600,000 gallons. To that I add 10 per cent. for contingencies, making a gross total of 660,000 gallons. From the bottom of the well to the top of the upper reservoir at Shooter's Hill is 290 feet; for friction, I reckon 35 feet, or 5 feet per mile; making a total lift of 325 feet, which would require engines of 92-horse power. The cost of providing that, including engine-house, pump, and sucker, will be £9200. For a distance of seven miles, the pipes will be of 18-inch diameter, which will cost £12,438. The walls of the reservoir will cost £2625; the embankment, £1700; and forming the bottom, £666; making the cost of works, £26,629; and, adding to this the ordinary per centage, £2662, makes a total cost of £29,292. In these figures is not included the cost of the land upon which it is proposed to construct the reservoir and pumping station. The quantity of land required is 13 acres 2 roods, and the cost is £2700, making the whole sum required £31,992. In my judgment, the works can be completed for that amount, with a margin for contingencies.

After some consultation between the counsel on both sides,

Mr. JOHNSON said he had the satisfaction to announce that the company had come to an arrangement with Mr. Swayson, and it would be only necessary to insert a protecting clause in the bill to meet his views. One point in dispute had been in reference to his bleaching-ground, and the other arose out of an apprehension entertained lest the works to be constructed would dam up the waters. He believed there was not the slightest ground for this apprehension; but the company were willing to do all that was necessary to ensure the protection wanted by Mr. Swayson. He would ask the committee, therefore, to adjourn the further consideration of the bill till the following day, in order to give an opportunity for the clause to be inserted.

On the following day, Serjeant WRANGHAM complained that three clauses had been inserted in the bill, which the promoters could not possibly agree to. One was, that in case of arbitration, whichever way the award was made, the whole of the expenses should be borne by the company; the second, that at all times the engineer of the opposite party should be allowed to inspect their works—to which, in itself, they had no objection, but then it was required that the cost of such inspection should be paid by the company; and the third was, that the other side should be at liberty to take compensation for water abstracted either in water, steam, or money; but that, if they elected to take it in money, the arbitrator should not only give them the amount of injury done, reduced into a money value, but, in addition, the amount which it would have cost the company to replace the water, if they had exercised the option of taking it in that way.

A long conversation ensued upon the points in dispute, it being alleged by the parliamentary agents on one side that the clauses objected to were amongst those agreed to by the parties before the bill came before the committee; and on the other that, if they were included, they escaped notice by special attention not having been called to them; and that, on account of this oversight, the committee would not be justified in inflicting a substantial injury upon the company.

The room was then cleared, and, on the public being re-admitted,

The CHAIRMAN stated that the committee had resolved to take the next case, and let the parties know, at the conclusion of it, what they had decided in reference to this matter.

In the course of the day, however, it was intimated that the parties had settled the point amongst themselves.

TUESDAY, MARCH 6.

MAIDSTONE, ROCHESTER, AND CHATHAM WATER BILL.

MEDWAY VALLEY WATER BILL.

MAIDSTONE WATER BILL.

BROMPTON, CHATHAM, AND ROCHESTER WATER BILL.

Mr. CALVERT, Q.C., and Mr. VENABLES, appeared on behalf of the Maidstone, Rochester, and Chatham Company; Mr. Serjeant WRANGHAM, and Mr. JOHNSON, on behalf of the Medway Valley Company; Mr. T. CHAMBERS, on behalf of the Maidstone Company; and Mr. HOPE SCOTT, on behalf of the Brompton, Chatham, and Rochester Company.

Mr. CALVERT, Q.C., applied to the committee for summonses to secure the attendance of two witnesses, Mr. Hawksley and Mr. Whichcord, who had declined to give evidence except under an order of their lordships.

The committee granted the application.

Mr. CALVERT said, in submitting the case for the Maidstone, Rochester, and Chatham Company, it would perhaps be convenient that, in the first instance, he should point out the places proposed to be supplied, and state the populations of each. At the south end of the district was East Farleigh and two other small places, with a population of 2033; they then came to Barming and Maidstone, with a population of 23,677; then to Allington, Aylesford, and Burham, with 2653 inhabitants; then to Rochester and Chatham, with 52,103; and, lastly, to Strood, Frindsbury, Brompton, and Gillingham, with a population of 5853. The two largest places, therefore, to be supplied were Maidstone, which might be taken at 24,000, and Rochester and Chatham, at something under 60,000 inhabitants. The plan which he had to submit to their lordships was of this nature. It was proposed to take the water from the river Medway above Farleigh Bridge, at which point it was intended to have a pumping-station for the purpose of raising the water into a settling reservoir of large capacity, capable of containing more than 8,000,000 gallons. From thence the water would be conveyed by pipes to the Maidstone service reservoir, which would contain about 600,000 gallons; and also to a larger reservoir, called the Rochester reservoir, which would be capable of containing 2,000,000 gallons. There would, of course, be a system of pipeage between these several reservoirs, and two systems of pipes would be laid down to Maidstone, so that, in case of fire, the town would have the advantage of a plentiful supply from each. The distance from East Farleigh Bridge to Maidstone Bridge was about half a mile, and the distance from the Maidstone reservoir to the Rochester reservoir another half mile, while between the latter and the town of Rochester the distance was about nine miles. The quantity of water that could be obtained was very large indeed, of which the committee would be satisfied when he informed them of the quantity which ran to waste over the weir in the month of November, 1858, which, he believed, was one of the driest periods known in this country. On the 9th of that month, upwards of 14,000,000 gallons passed over the weir; on the 11th, 20,000,000; on the 14th, 20,000,000; on the 15th, 16,000,000; on the 16th, 7,000,000; and so on until the 23rd, when there was a waste of 13,000,000 gallons. This would give an idea of the immense quantity of water which could be obtained in case the population of this district should greatly increase, and would satisfy them that the plan he had to submit was not only adequate to the present demand, but capable of such augmentation as might be required. Taking it at the utmost, the present demand would not exceed 2,000,000 gallons per day; but of course, when dealing with districts like these, it was important to adapt the system to such changes as circumstances might require. With regard to the quality of the water, he would lay before the committee a

report made by Dr. Miller in October, 1859, from which it would appear that the Medway at Farleigh, which was the spot where the promoters would take their supply, was the best of the whole of the sources referred to. The capital of the company was £80,000, and the income they reckoned upon was made up in this way:—If all the houses in Maidstone, Aylesford, Rochester, Chatham, and Strood took the company's water, the rates would yield an annual return of £10,606; but the company assumed, for the purposes of this inquiry, that only one half would do so, and the amount would, therefore, be £5303. Then there were the various public institutions, hospitals, asylums, breweries, and other extra supplies, which were reckoned at £3277, making a total of £8580. Against this the expenditure would be, working expenses, including management, £2145; interest at 7 per cent, upon £83,000, that being the whole capital authorized to be raised, although it would not all be required, £5956; making, altogether, £8101. With regard to the want of an improved supply of water, he need not say much, as he had the advantage of addressing a noble lord who sat upon a committee which investigated the subject last year, and who would doubtless recollect that, in reference to Maidstone, there was no difference of opinion on the point. He proposed, therefore, to trouble the committee, but very briefly, in formally proving that necessity; indeed, it must be evident, when there were several competing schemes within the district, that the want was one which had made itself extensively felt. The only supply of water at present was from the Luton works, and from some wells in the neighbourhood. He believed it would be found that the Luton works supplied water from the chalk only, and it was therefore desirable that the inhabitants should have the opportunity of procuring an abundance of soft water if they wished it; while for the Government works at Brompton and Gillingham it would prove of great advantage.

Lord DUNGANNON said, if he recollected right, the bill of last year applied only to Maidstone.

Mr. CALVERT said it did; and perhaps it might be convenient to state that the difference between the two schemes proposed last year was that the one proposed to take water from a hill, and the other from low ground near Maidstone—the one exclusively from the chalk, and the other partly from the chalk and partly from the green sand. One of those schemes was rejected by their lordships, and the other, which passed the House of Lords, was rejected by the Commons. The consequence was, the inhabitants were still without a proper supply of water.

Lord DUNGANNON: The Luton scheme was the one accepted by us.

Mr. CALVERT said it was not called the Luton scheme. It was for procuring a supply of water from a place half way between Maidstone and Luton, called Lidsing. The other scheme, which was rejected, was called generally, Mr. Betts's scheme. When he reminded their lordships that the towns of Maidstone, Rochester, and Chatham were large and important, and at the same time remarkably dirty, towns, and when he informed them that they were principally supplied from wells which, in some parts, were exceedingly brackish, they would agree with him that an improved water supply was very much needed. In truth, the contest on this occasion would be, not as to whether an additional supply were needed, but as to the merits of the several schemes before their lordships; and as that would depend almost entirely upon the evidence of the gentlemen by whom those schemes were propounded, he would not trouble the committee by giving that evidence at second hand. The only petitions against the present bill were from the opposing schemes, except one, which was from the South-Eastern Railway, for the protection of their works. The promoters, so far from wishing to injure the property of the railway company, were desirous of giving them every necessary protection, and therefore there would be no dispute on that point. He would now proceed to call evidence.

Mr. *John Whichcord*, examined by Mr. CALVERT.

I am the county surveyor, and reside at Maidstone. I have had the question of the supply of water to the town under my attention for many years. I consider there is great need of a better supply, and some years ago I reported to the Paving Commissioners upon the subject. It has been from time to time brought under the notice of the town, and it is admitted on all hands that something ought to be done to improve the supply; the only question has been, whether this should be done by a private company, or by the ratepayers' charge. The supply at present is chiefly obtained from some springs at a hill a little above the town, and from some conduits in the town itself. The springs are not capable of supplying more than 12,000 gallons in 24 hours. The remainder of the supply to the inhabitants is from wells and pumps. My opinion has been that the supply to the town ought to be taken from the Medway, as being an unlimited source of good quality. I am acquainted with the County Lunatic Asylum. It is supplied with this water, which is considered very good for all purposes, except that it is too soft to be pleasant to many persons. There is also a supply of water to the asylum from a well sunk in the green sand to a distance of about 120 feet. I have seen the plans which the engineer of this company proposes, and, according to my view, they appear to be sufficient for the purpose.

Cross-examined by Mr. JOHNSON: I have been forty years in Maidstone, which is situated on the banks of the Medway. The waters of that river are very much polluted in passing through the town, and could not be used for drinking purposes. The river, no doubt, receives a large quantity of the surface drainage of the weald of Kent, but its original source must be from springs. At particular seasons of the year, after heavy rain falls, it is very turbid—at the present time it is so—and it is liable to great fluctuations as to quantity, as we are subject to floods in Maidstone. The river, in its course, flows through a great deal of hop-ground, which is highly manured—more so, perhaps, than for any other purpose—and, to some extent, the water is affected by that. Some time ago, Maidstone was very much divided on the question of the water supply, but I believe the feeling has very much subsided. There is no question as to the want of water, and in dry seasons the people get up early in the morning to have the first chance at the pump-handle. There are a great many cesspools in the town, though not so many as formerly. The improved drainage does not tend much to improve the purity of the river. For domestic purposes, I think the water is very good, but a large number of persons in the town give the preference to spring water. I do not know that the navigation of the river is often stopped for want of water—certainly not at Maidstone.

By Mr. CHAMBERS: The water used for drinking at the lunatic asylum is drawn from the well, but that not generally, for the medical officer gives a most excellent character to the river-water for that purpose. The well is sunk through the chalk into the green sand; it does not go below it. The townsfolk are in favour of a company being formed for the supply of water, but I am not aware that they would give the preference to a company whose works were at a distance.

Re-examined by Mr. CALVERT: All they want is a good supply at a cheap rate, and whether they get it from company or another is not material. There has been a strong feeling manifested in the town against water-works being established at the expense of the ratepayers. The water in the river at Farleigh is much purer than below Maidstone, as it is contaminated with sewerage matter in passing through the town; and not only that, but there are two other streams which have paper-mills and other works upon them, and which discharge a great quantity of offensive matter into the river there. The water used at the lunatic asylum is the same as that at Farleigh, and, well filtered and properly managed, I think it is very good drinking water.

By Lord DUNGANNON: The question of a supply to the town from the Medway was raised last year, and there were very strong objections urged to it. I think the objections arose from the difficulty of purifying and making the water pure. I think the point in contest was between Mr. Betts's plan and the Lidsing plan, and the river plan was entirely cast aside by some of the witnesses.

Lord DUNGANNON: But was not that the decision of the committee? I happened to be on that committee, and I recollect that the river Medway was proposed as one source of supply, and evidence was given that it was next to impossible to purify it.

Witness: That was the opinion; exactly so.

Mr. CALVERT: Your lordship will allow me to observe, that there was no Medway scheme before your lordships last year. Some of the witnesses on the other bills spoke of the Medway, and evidence was given, *pro* and *con*. There were only the two schemes—Mr. Betts's and the Lidsing springs—before that committee.

Lord DUNGANNON: But the question arose whether the Medway would not be better than either, and afford a more convenient supply; but the evidence was, that the water in the Medway was exceedingly impure.

Mr. CALVERT: But there being no Medway scheme propounded, there was no one here to sift that evidence and see whether it was good or bad.

Mr. *T. Plumly*, examined by Mr. CALVERT.

I am a surgeon residing in Maidstone, and have given much attention to the question of the supply of water to the town, about the necessity of which supply there can be no doubt. I have made a great many analyses of the river water, and have corresponded with scientific persons upon the subject. As the result, I think the Medway is the very best source of supply to the town. It is perfectly pure water after filtration. Before filtration it contains merely a little mud. I draw a distinction between the water above and below Maidstone; I am speaking of the water at Farleigh. There is very little organic matter in it, and it can be readily made clear for domestic purposes. I have made hundreds of microscopic observations upon it at all seasons during the last ten years. Its hardness varies from 6° to 8°, which is very low; in London it is 16° or 18°. There is no water in London so pure. The rainfall makes it turbid at certain times in the year, but in a settling-reservoir it would soon become pure again.

Cross-examined by Mr. CHAMBERS: I have resided fifteen years at Maidstone, and know the course of the stream. The tide flows up as far as Allington Lock, but I have never detected that any impurities have been carried up by it. The small portion of organic matter in the water is of a vegetable character. I presented a report upon the subject in 1852, in which I said that, "like the water of all rivers, it contains some organic and inorganic matters, though in small quantities." There are grazing-grounds for cattle on the margin of the river, but there are no bathing-places at Farleigh Lock—they are a mile below.

By Mr. JOHNSON: The waters I have analyzed were taken from almost all parts of the river. In all I find the chemical properties identical, except where the streams on which the mills are run into the Medway. I have experimented on the waters, from Farleigh up to Tunbridge on the one side, and to Maidstone on the other. The town of Tunbridge drains into the Medway, I believe. It is about eighteen miles from Tunbridge to Farleigh. The quantity of organic matter which I have discovered by any experiment has never exceeded half a grain, and I have never discovered any of the animalculæ which are to be found in impure water. I have never found any nitrogenous matter; it has been found by Dr. Miller. It must exist during the decomposition of animal or vegetable matter, but it is not appreciable by chemical tests. I have never found any ammonia in the water, and I think it could not exist largely without being discovered. Mr. Brazier, at present analytical chemist in the University of Aberdeen, assisted me in my experiments in 1852, with a view to a supply of water to the town from the Medway. The degree of hardness has never been higher than 8; I have found it down to 4, depending upon the amount of rainfall; and by boiling it is reduced to 2. It does not contain sufficient organic matter to have any effect upon lead pipes after two years' use. The effect upon lead is produced by the liberation of carbonic acid from the water. Distilled water has no effect upon lead, except when exposed to the air. I drank some of the water from the Medway this morning. It was taken at Maidstone Bridge, and filtered. The town itself is a mass of cesspools; and, until fifteen years ago, there were no drainage works in it. The outlet of the present drains is into the Medway.

Re-examined by Mr. CALVERT: The tide very rarely washes over Allington Lock. There is another lock above Maidstone, and Farleigh is considerably beyond that; so that none of the impurities which get into the Medway at Maidstone can at all affect the water at Farleigh. If water has no effect upon lead, I infer that there is no carbonic acid in it; and if there is no carbonic acid, I infer there is no organic matter. The bathing-places spoken of are below the upper lock. There is a certain class of animalculæ, called Rotifera, the presence of which in water is an indication of its purity, as they cannot live in foul water. If there was much nitrogenous substance in the water, it would be easily discovered. In 1852, I examined the water, not knowing that the result would be brought forward in reference to the supply of Maidstone; and Mr. Whichcord, who made the report referred to, requested me to give him the result of my observations during the three previous years, which I did. My statement then corresponded very nearly with the evidence I have now given.

Mr. *Thomas Purbrick*, examined by Mr. CALVERT.

I am the manager of the Tunbridge Water-Works. The supply there is taken entirely from the Medway, and I think there is very little difference between the quality of the water there and at Farleigh. At Tunbridge, the water is drawn into subsiding-ponds, after which it undergoes a sand filtration. It is then pumped up into an open reservoir above the town, which reservoir supplies the greater portion of the inhabitants. The best answer I can give as to the quality of the water is, that we have never lost a customer since we commenced our operations in 1852, on account of complaints of quality. During flood times, there are considerable impurities in it; but, by allowing it to subside for a few days, we get rid of all the mechanical impurities, and after that we pass it through a system of filtration, which in addition to sand, contains a portion of charcoal, so that the water is purified, as well as clarified. The filtering-bed consists of strata of gravel, sand, and charcoal.

Cross-examined by Mr. JOHNSON: We derive our supply from above the town of Tunbridge. The greater part of the town drains into the Medway

If the inhabitants were not satisfied with the water we supply, they could get their water from wells, of which there are plenty; but the people prefer our water. The charcoal is used for purification; the sand and gravel remove all the substances which are in suspension. Our supply is 50,000 gallons a day, and I do not see why, for 2,000,000 gallons per day, the same system of filtration might not be adopted. Common charcoal, bought in small quantities, costs about 1s. a bushel. I cannot tell you how much we have used, for it has never been renewed. It seems to have the property of retaining its efficiency. I have never made any analysis to ascertain the amount of organic matter in the Medway above Maidstone. The degree of hardness, as given by Mr. Cooper, was 6·5. The organic impurities are mainly of vegetable origin. The soil in the neighbourhood of Maidstone is highly manured.

By Mr CHAMBERS: The top layer of sand in the filter—about the eighth of an inch—is taken off once in two or three months; or, if there are no floods, it will go as long as five or six months. The filtering materials cost about £57, nearly eight years ago, when the works were constructed. The distance between Tunbridge and Maidstone, taking the course of the river, is about 20 miles. I do not know how many inhabitants reside on the banks of the river between the two places.

Re-examined by Mr. CALVERT: Whatever the amount of organic matter in the water may be, it is removed by filtration; and the water is found to be acceptable to the inhabitants of Tunbridge. We have not had it tested since 1852, as we have had no complaints of its quality.

By the CHAIRMAN: The cost of renewing the filtering matter is merely that of labour in removing and washing the sand; £2 a year would include the whole expense.

Mr. *Thomas Spencer*, examined by Mr. CALVERT.

I have had considerable experience in analyzing water, as adviser upon the subject to many of the water companies in the kingdom, and to corporations. I am chemist to the New River, and several of the large companies, and, during the last fourteen years, it has been my duty, almost exclusively, to examine water with a view to the supply of towns. I am also chemist to the Liverpool Corporation. I was employed to examine the water about Maidstone in 1854 by the Commissioners of Paving. I made a report to them as to the results of my examination. The commissioners had no settled plan; they wished to know which would be the best source of supply, and I examined all the water in the neighbourhood for the purpose of ascertaining, including that which is now proposed to be taken. This table gives the results of my analysis. In the Medway above Farleigh Bridge, there were 11¼ grains of solid matter in the gallon after evaporation; at the Palace, 13·12; at Allington Lock, 14·10; Camden Street and County Road, which are in the town, 104 grains; at the pump in Earl Street, 50·20; at the town reservoir, 26·10; and at Lower Fant, 26 grains. The natural hardness, as taken by the soap test above Farleigh Bridge, which is No. 1, was seven and two-tenths; No. 2 was eight and one-tenth; No 3, which was the Medway at Allington Lock, 9°; all the rest are higher. The permanent hardness, after ten minutes' boiling, of No. 1, was four and two-tenths; of No. 2, was five and three-tenths; and No. 3, four and five-tenths. In the water from the Medway, there were 3·75 grains of carbonate of lime per gallon. The total number of grains at that period were 11·25; the organic matter being 1·40. The result of this examination showed that the water of the Medway was softer, and had less of impurity in it than any of the others. When the samples were taken it was a rainy period, and the water was somewhat turbid. I had not then been long engaged in examining the waters of the south of England, but was more familiar with the waters of Lancashire, where the turbidity of a river is generally owing to clay, and is very difficult of filtration, requiring the top dressing of sand to be removed oftener than we like. I therefore said in my report that, if the commissioners concluded to take that water, they must make up their minds to a little more expense in filtration. Subsequently, I was written to by one or two persons, as there seemed to be some feeling in the town with regard to the water, and the commissioners got me to examine it again in 1858. Then I found that the turbid matter which I supposed to be clay only was clay and chalk, and not difficult of filtration; and I therefore said that the objection I had formerly made as to the expense did not now obtain, because of the carbonaceous nature of the suspended matter in the water. All that has been said of the Medway holds good of the Thames, which, with the exception of the New River supply, is the water that is drank in London. There are few rivers in England, where there is a population on the banks, in which the water is as good as in the Medway. I have seen the analysis of the water made by Dr. Miller. I believe it is strictly correct; the water having been taken under more favourable circumstances, it shows some difference from mine; he makes out that it is purer than I did. With the exception mentioned—that of the expense of filtration—I recommended the Medway to the commissioners as a source of wholesome supply in 1854. When we speak of the quality of water, we speak relatively to such water as is to be had in the locality. It is impossible to get perfectly pure water; but, as compared with a supply from a river to any other town in the kingdom, I should say the Medway water is the best, and I speak advisedly upon that point. The organic matter it contains is very much less than we have in London Water. The New River water at this moment contains 2¼ grains per gallon, and it ranges between that and 1¾, and the others are practically about the same; but in all my analyses, the Medway did not show more than 1½ grain. The water of the Thames does contain nitrogenous matter, which, in itself, is by no means unwholesome; it is only objected to because it suggests its origin. We do find ammonia in Thames water; but it is only when operating upon hogsheads of it.

Cross-examined by Mr. CHAMBERS: After I made my report to the commissioners, I believe I was at a public meeting at Maidstone, where it was resolved that water derived from the chalk was the best for the supply of the town. The inhabitants were very much opposed to the water from the Medway, because the commissioners intended to furnish the supply, and the feeling was, that they would have to be taxed for the cost of works before they got the water. If, on examination of the waters of that district, I had found any with less organic matter in it, I should have thought it better, provided it was not much softer; as, if it were, it would act as a solvent upon the receptacles in which it was kept. It is the degree of hardness in the water which prevents it acting upon lead. The exposure of water to air would not have a tendency to oxygenize it, if there was a sufficient quantity of salts in it. Nine or ten grains in a gallon is ample to protect water from lead. The character of the water in a river supplied by surface drainage is very much affected by the character of the soil in the new red sandstone, but not in the chalk or marl districts, because the chalk and marl through which it percolates has a tendency to take off the organic matter arising from the manures employed on the land. In fact, farmers would not drain so much were it not so. If there were a layer of clay near the surface, it would effectually intercept the manure. I do not mean to say it would be the best for growing—it would be too cold, of course; but it is the best soil to prevent manure from flowing away. The iron in the clay lays hold of it, and intercepts the organic matter from manured fields.

By Mr. JOHNSON: In 1858, when I examined the water with particular reference to the suspended matter in it, I found that it contained clay and carbonate of lime. I am not aware that the silt from the river Medway is an article of commercial value for the making of Portland cement. I do not know what had been the amount of rainfall at the time I took the samples. It is not necessary, in order to arrive at a proper understanding of the matter, that you should look to the highest degree of rainfall on the one side, or of drought on the other. Indeed, it is seldom or never done; for rivers are so generally constant, within two or three grains of solid matter, and within half a grain of organic matter, that experience shows it to be unnecessary. No doubt, nitrogen produces nitric acid, and, in the course of its transition from one state to another, it evolves deleterious properties; but you must allow me to explain that, when nitric acid is found in water, it by no means follows that it has been produced from fœcal matter or manure. It may arise from atmospheric influence. It is a part of Professor Liebig's theory of the presence of nitric acid in water; and hence he says that a good shower of rain is so much more beneficial to the land than so much ordinary water, from the ammonia that is in it. It follows, from what I have said, that, if you find ammoniacal qualities in the water, it is, *per se*, no objection to the water. There are no chemical means of knowing whether it arises from fœcal matter or atmospheric influence, and amongst chemists it is not considered of any consequence.

Re-examined by Mr. CALVERT: All the matter held in suspension in the water would, by subsidence, be got rid of; and it is merely a question of expense to the company how to remove it. The same is also true with reference to the discoloration. The water itself is not discoloured; it is the matter in the water which gives it the appearance of being so. This would not hold good with reference to bog-water and water coming from some descriptions of soil; there is a colouring in that which no filtration will remove. The water in the Medway, I should say, comes largely from springs.

By Lord DUNGANNON: I have not examined any of the other plans by which it is proposed to supply Maidstone. I have not examined the springs at Lidsing. The soil round Maidstone is mostly chalk marl. The water of the Medway would certainly be better for supplying the town than any of the sources from which I took samples. I only took samples from between the town and the lock. I have heard that they have sunk to the green sand there; and the water from the lower green sand ought to be very good. The lunatic asylum is supplied by a well; but the water is not good, and my opinion is they have not gone far enough. The medical practitioner there told me that he preferred the water which he filtered. The filtering there was not done properly, as the ordinary quantity passed through a square yard is 700 gallons, and they sent 3000 gallons through. It therefore cannot be considered as a fair experiment.

Lord DUNGANNON: Maidstone is a town of large size, and you believe that no better source of supply can be obtained for it than from the river Medway. If I understand you right, you do not appear to think that river-water generally is the most favourable, but you think that, for the most part, it is as good as any that can be obtained there?

Witness: If you will allow me to make a comparison, I should say that London is better supplied than any other metropolis in Europe. I then go to Maidstone, and I find the water is as good again; and therefore I say, that Maidstone would be exceedingly well supplied from the Medway. But then I hear there is a scheme to get water from the chalk; and I am not here to oppose that, nor to say that that would be bad water. The process of softening it, which I believe was invented by my friend Dr. Clerk, I have always said is a very good one; and I have written to the Maidstone people to say, that if they can get a plentiful supply of chalk water, and ensure that supply, I should say it would be as good as the other.

Lord DUNGANNON: Would you not consider, upon the whole, that the chalk water is as good as the river water? They are different in character, are they not?

Witness: When filtered, I can see no difference, except the chalk water, as it is supposed it will be, about 4° of hardness, whereas the Medway would be 6½°; but it does not follow that, because in one case it happens to be 4°, the water which they are about to get will have that hardness; for, if it contains much sulphate, it may be 8° or 9°. From my experience with regard to well-sinking, I am always very doubtful, and, whenever there is a river close to a town, the water of which is good, I say the best way is to take it from the river. I consider the water in the Medway is the best I know of, except I go into a mountain district.

By Lord MIDLETON: During the last two years, the supply of water from the chalk, even at great depths, has considerably diminished.

Mr. *Alfred Meeson*, examined by Mr. CALVERT.

I am a civil engineer. In 1858, I inspected the country round Chatham, Rochester, and Maidstone, with a view to the supply of those places with water. I found complaints in all those places as to a deficiency of supply. I particularly addressed my attention to Maidstone, and there I found an entire dependence upon pumps and conduits in the streets; and I was informed that at times those afforded only a short supply. As far as I can judge, the quality of the water was extremely bad; it was very hard, and there was a great deal of impurity in it. I found the same state of things all along the district to Chatham and Rochester, as well as in those places. In some of the wells the water was brackish, and very offensive. At Gillingham and Brompton I found they were supplied by a company already established, with water from the chalk. The engine and works were situated at a place called Luton, where the water was pumped from a well, and carried to a reservoir on high ground at Chatham Hill. There are hospitals and many public works at Chatham; there is also Fort Pitt, a barracks at Brompton, and St. Mary's Hospital. At the time I was there I was told that the water supply was a limited one, and that to many parties in the neighbourhood it was very deficient. I was consulted as to the best means by which a supply could be obtained, and the result of my observations was, that the Medway was the best source to look to. The spot I selected for the purpose of drawing the water was above Farleigh Bridge. I gauged the river there in November, 1858, which was a period of great drought, and therefore a good time for ascertaining the minimum supply it would afford. The result of my gaugings was this: on the 9th of November, 1858, there was a surplus quantity of water going over the weir at Farleigh Lock of 14,888,000 gallons; on the 11th, 20,664,000 gallons; on the 13th, 20,664,000. On the same day, in the afternoon, it had decreased to 16,698,000 gallons; on the 15th it was the same; on the 16th, at nine o'clock in the morning, it was reduced to 7,545,000 gallons; and at eleven o'clock it was 11,071,000 gallons. It was quite evident, therefore, that there was an enormous supply: in fact, that is not the true representa-

tion of the water going to waste down the river; for, in the first place, the sluice of the lock being defective, allowed large quantities of water to pass through it; and then these gaugings were taken at such a distance from the ground of the weir that they did not enable me to get rid of the initial velocity of the water, and therefore did not show the full quantity going over. But as my object was only to satisfy myself that there was an abundant discharge, I did not think it necessary to take those minute fractions that I should have done in some cases. I have no doubt in my own mind about the quality of the water being good, and I have seen the analyses made by scientific persons, which show that it is the best that can be procured. Having satisfied myself on these points, I proposed to those who had consulted me to construct at Farleigh upon a strip of ground there subsiding-reservoirs, into which the water should be raised previous to being filtered, and that these reservoirs should be connected with two or three filters, through which the water should pass before being sent into the service-reservoirs. I also proposed that there should be a pumping-station, for the purpose of pumping the water up to the reservoir, situated upon high ground at that place. The distance from Farleigh Bridge to the Maidstone reservoir is scarcely half a mile; this is also called the low-service-reservoir. The pipes to convey the water will be 18 inches bore. The capacity of the reservoir will be 650,000 gallons; it will be partially sunk in the ground, lined inside, and roofed over. The only works in Maidstone will be for the distribution of water. The Rochester reservoir, which will be equally available for the supply of Maidstone, will hold 2,000,000 gallons, and the pipes from it will be of the same diameter as the other. The distance between this reservoir and the town of Rochester is nine miles, and there are several villages on the way in which we shall make arrangements for the supply of water—viz., Aylesford, Burham, Wouldham, &c. The iron main to convey the water will have a 20-inch bore until it comes to the city boundary; then it becomes 18 inches, because the inclination is greater from that point, and a less bore is required. From Rochester, the main branches in one direction over the bridge to Strood, and in the other through Chatham to Brompton and Gillingham. The arrangements will enable us to supply all these places by gravitation. This scheme, or one the same in principle, was proposed last year, but it failed on the standing orders. The estimated cost of the works is £76,000, and that amount is composed of the following items:—Land, with 20 per cent. for contingencies, £3869; reservoirs, £16,478; engines, pumps, &c., £9080; engine-house and other buildings, £4070; pipes, mains, aqueducts, including all out-works, repairs to and making good pavements, and contingencies, £41,192; cocks, hydrants, and other similar things, £1182. We have an offer from respectable contractors to do the work for that sum.

By Lord DUNGANNON: The sum put down for the land is my own estimate. The quantity required will be four acres of meadow-land at Farleigh near the river, which is not valuable land, as it is liable to be flooded. There will be nine acres for the reservoir at Barming Heath—altogether, the acreage required is 17 acres, 3 roods, 4 perches, the larger portion of which is merely heath-land, and of no great value.

By Mr. CALVERT: The mains will pass along turnpike and parish roads, with one or two slight exceptions. I think I have allowed an abundant margin in my estimate for all contingencies; in fact, I think it will be saved upon rather than exceeded. The cost of the filtering-beds is included in the item of £16,478 for reservoirs. I have no doubt about their capacity for the purpose required I have allowed for 24 gallons consumption per head per day, which is quite sufficient for ordinary purposes, and is never exceeded except in manufacturing districts. Should the population increase largely, there is nothing to prevent us from doubling the supply now provided; and the engine power will be nearly sufficient. The total engine power will be 157 horses, which is divided into three—one to supply the filter, and the others to supply in duplicate the high lift into the reservoirs. They will be all at Farleigh, and will be amply sufficient to supply the 2,500,000 gallons per day, which is what is required. My calculations as to income are as follows:—The water supplied to the whole of the houses in Maidstone would yield a rent of £3600; Aylesford, and the district between Maidstone and Chatham, £150; Rochester, Chatham, and that neighbourhood, £6273; Strood, Frindsbury, &c., £583—making a total of £10,606; and I take one-half of that, because, though ultimately more persons will take the water, it is seldom found that it exceeds one-half of the inhabitants in the first instance. For the baths, extra water-closets, and other extras to private houses, I reckon £560; hotels, public-houses, stables, horses, carriages, markets, washhouses, gardens, &c., £500; railways, steam-engines, breweries, dyers, slaughter-houses, and other trades, £520; prisons, asylums, unions, hospitals, and other public establishments, £700—making, in addition, £3277, and giving a total income of £8580. I take the working expenses at 25 per cent. upon the income, seeing they will be very economical, as they will be confined to one locality—£2145; I add to that the interest on £85,000 capital, at 7 per cent.—£5956; making a total expenditure of £8101, and leaving a balance in favour of the company of £479.

WEDNESDAY, MARCH 7.

Thomas Hawksley, Esq., C.E., examined by Mr. CALVERT.

I am acquainted with the river Medway, and also with Maidstone, Rochester, Chatham, and the neighbourhood. I have been for a long time consulted with regard to the water supply of Maidstone. I have been consulted by the authorities of the town. After a long and careful calculation of the facts of the case, I have come to the clear and distinct determination in my own mind that the Medway is the proper source of supply of water, as being ample in quantity and the best in quality. I have looked at the sections and plans, with a view to giving evidence here, and I believe they are perfectly sufficient for the purpose. I am acquainted with Farleigh Bridge, and know the supply of water there; also the mode in which it is proposed to pump it into the subsiding reservoir, and distribute it. I have examined the estimate and prices of Mr. Meesom, and believe they are higher than the works can be executed for. One of the advantages of the plan is, that it avoids all unnecessary expenditure. Having regard to the formation of the county, this is the nearest spot at which an abundant supply of good soft water can be obtained. I have taken into consideration the supply necessary for the Government barracks and works. The quantity provided for is 2,000,000 gallons per diem, which I know to be sufficient for the whole district. I prefer this plan to any attempt to obtain water from wells in the neighbourhood of Farleigh Bridge. I do not think any wells there would yield the quantity.

Cross-examined by Serjeant WRANGHAM: The Medway does not become impure until the Tovil Brook falls into it some distance below Farleigh Lock. That is where the refuse from some paper and oil mills falls into the brook. Between Farleigh and Rochester a supply could be obtained from the chalk and green sand springs. The former come to the surface, the latter do not, but they can easily be reached. Chemically considered, the water of these springs is inferior in purity to that of the Medway. It is beautifully clear, but harder. The Medway water would require filtration, and the spring water would not. I have not made out whether a sufficient supply could be obtained from these springs. There are several springs. I was concered in a bill for the supply of Maidstone last year. There were then two rival schemes before Parliament. I don't remember that one was called the Billington scheme. The two schemes before the House of Lords, were the Aylesford springs scheme, and that promoted by the friends of Mr. Homersham. Now you refresh my memory, I believe there was a third scheme for bringing the water from the Medway, but it never reached Parliament; it was lost on the standing orders. I do not know whether it closely resembled the present scheme, as I had nothing to do with it. I only know it proposed to take water from the river Medway near Farleigh Lock, and pump it up to Barming Heath. One bill proposed to take the Aylesford springs for the supply of Maidstone. I was concerned for the latter bill, and gave evidence upon it before the committee. I was engineer to that scheme, and said before the committee that it was the proper source for the supply under the circumstances; but I also said that in my judgment the Medway would afford a better supply of water. The Billington scheme was never heard of in Parliament. I certainly recommended their lordships to pass a bill for the supply of water from Aylesford springs. I am aware that the promoters of the Medway Valley scheme are prepared to take the springs I advocated last year, plus some others.

By Mr. CHAMBERS: I recommend the green-sand water as very good. It is the same as that of the Medway, minus certain impurities, as the sand forms a natural filtering-bed. When I recommend the Medway water, I mean, not only that it is excellent as regards its chemical properties, but that it exists in such volume that there can be no doubt as to the sufficiency of the supply for the entire district. I have, on many occasions, taken pains to ascertain to what extent the Medway remains pure at flood-time. I know the river at Tunbridge, but I do not know what system is adopted at the works at that place for purifying the water. In my judgment, it would not be necessary, at Farleigh Lock, to supply a double system of filtration, to release the mechanical and chemical impurities. If, however, the water were first purified mechanically, the filtering-beds would last longer, though the same effect would be produced if the water were pumped directly into the filtering beds. The filtration removes everything, except what is held in chemical suspension. There are two matters held in suspension in flowing water, but there is only one held in suspension when water is quiescent. The more weighty particles, which are not heavy enough to fall when the water is in motion, sink to the bottom when it is in rest; but the light flocculent matter, which gives the colour to the water, and will not deposit itself, should be passed through filtering-beds to get rid of it. Nearly everything that is held in chemical combination then remains in suspension. I do not remember to have seen the tabular statements put in respecting the composition of the water, by Dr. Spencer. If there are 11½ grains of solid matter chemically combined per gallon, any system of filtration would leave that quantity nearly unaltered, and the solid matter would go to the consumer. I have examined the plans with sufficient care to be able to say that Chatham Hill could be easily supplied by the proposed works. I do not know the levels of Brompton, and therefore I cannot say whether that place could be so supplied. There are risks in carrying water along an unusually long main, apart from the great expense of the undertaking, but they are of that character which usually cease to be risks after the first three or four months, as the pressure soon finds out all the weak pipes, which burst, and are replaced. For instance, London is supplied from Hampton and Thames Ditton. The main from Thames Ditton is twelve miles long; there is no interruption, although the water is pumped through the main, and there is all the stress of the engines upon it. Pipes are, of course, made heavy in proportion to the stress they have to bear. I have examined the sections, so as to see how the heights vary. In my judgment, the amount of variation is not a thing to be avoided at all. At Liverpool, where there is the largest main in the world, the water goes for 24 miles, across deep vallies and over high hills, and yet the delivery discharges exactly according to calculations. The declivities in Lancashire are more than double those in this case. If the declivities were drawn out on the plan on the natural scale, they would scarcely be visible. No danger is likely to arise from accumulations of air at the higher pipes, because a little self-acting valve is applied, which pumps out the air. There are no difficulties in this plan, neither engineering nor practical.

Re-examined by Mr. CALVERT: With regard to the Aylesford springs, the amount of water diminishes very considerably in seasons of drought. It falls down to as little as 580,000 gallons per day, from between 900,000 and 1,000,000 gallons. I made my examination in November, 1858 Last year, the only alternative before the committee was that between the Aylesford and the Ledsing springs. I was concerned for the former. I informed their lordships that, in my opinion, the Medway was better than either. That was always my opinion. The Medway water has been recommended, on Government authority, for metropolitan supply. The question of impurity has been carefully considered, and adequate means are provided at Farleigh for removing the impurities which exist by means of subsidence and filtration.

By the COMMITTEE: Before the committee of last year, I stated the actual circumstances—viz., that I had been called on by the commissioners to investigate the chalk water supply and the Ledsing supply. There had been two gentlemen in consultation. One recommended one spring, and the other recommended the other. I went down and found the yield of the chalk springs very large at the time, there having been for two or three years past a great deal of rain. But I ascertained, also, that in long-continued dry weather, the flow becomes very much reduced, though I could not get the amount. I was obliged, therefore, to wait until their had been one or two dry seasons. The springs which were recommended by one party then diminished to about half. Last year, one set of springs which I examined had diminished from about 400,000, which they yielded at the lowest point when I made my report, to less than 100,000 gallons per day. I also found that the chalk springs were not available. I then examined the Medway, and found the quantity and quality good. I therefore, in my report to the commissioners, recommended them to resort to the river. I have no recollection of being asked by the committee anything about the impurity of the Medway. I did state the river was the best, because I was questioned with regard to my report to the commissioners, and I stated what the contents of that report were, and why I made it.

Lord DUNGANNON: In my recollection, a good deal of discussion arose whether or not the river Medway would not be the best mode of supplying Maidstone; and there was a statement made to the committee that there were great impurities in the water of the Medway.

Witness: If a statement of that sort was made, my opinion differs greatly from it, and did so then.

The CHAIRMAN: The report of the committee and the evidence is before

us, so that there will be no difficulty in ascertaining what was done, if necessary.

Lord LONDONDERRY: Are you aware that there is a difference in the diameter of the pipe somewhere approaching the city boundary?

Witness: Yes, I understand that it is 20 inches in diameter to the city boundary, and 18 inches between the city boundary and the town.

Mr. CALVERT: That is on account of the descending level?

Witness: So I understand. The friction in the pipe is increased in a certain ratio by the higher amount of velocity with which the water has to pass through the smaller pipe—the quantity being the same; and therefore the height to which it will ascend at any remote place is diminished by the amount of friction—it may be a few feet. I should not say that that was a fault in the undertaking, if the small pipe was large enough, as undoubtedly it is in this case. I have made calculations upon the subject. If there be a fault, it is that the pipe leading down to Rochester from the elevated reservoir is too large in this way; instead of having all the water collected by the higher reservoir, it would be better to have a smaller reservoir nearer to the town, and then to have a smaller pipe which should have flowed into that reservoir day and night, and not be exposed to the variations of draught to which it will be subject by the intermittency of the rate at which the water will be drawn. That would very much conduce to the advantage of the undertaking. But that 18-inch pipe into Rochester is amply large enough. No inconvenience or damage is likely to result at the junction of the two diameters. The junction is effected by what is called the "taper pipe"—a pipe formed like a trumpet—the wide end attaching itself to the larger pipe, and the small end to the smaller one, so that there is nothing like concussion.

By Lord SALTOUN: The soluble organic matters in the waters would be removed by charcoal; but in solution the salts of lime or magnesia will still remain. London water, if it be good water, on the whole contains 18 grains of solid matter per gallon. This water contains, I believe, some 10 or 12 grains. There will certainly be no deposit at the junction of the ascending and descending pipes, nor will there be any stricture at that point. All that happens in that case is that water, in passing from one to the other, has to increase its velocity. The pipe being completely full at all times, there is no concussion; so that when the water has passed along to the small pipe, it leaves the small pipe to go into any house or cistern with a greater pressure than it would have done if the pipes were of the same diameter.

Mr. *Meesom* recalled, and examined by Mr. CALVERT.

I consider the plans now before the committee exhibit the best source for the supply of water to Maidstone. With regard to the decreased diameter of the pipe, at the city boundary, I think the velocity of the water will be much the same in the smaller pipe as in the larger one; it depends on the quantity broken. If the reservoir were constructed near Rochester, the main for the high service at Farleigh need not be so large as now contemplated, and the difference in the size of the main would more than compensate for the construction of the reservoir. It is no part of our present plan to have such a reservoir; but, if it were found necessary, there would be plenty of money to construct it with. There are no abrupt declivities in the course of the main worth mentioning. The level of Brompton is, on the whole, lower than the highest point we take at Chatham, and there would be no difficulty in descending to it. The effect of our system of filtering would, I contemplate, be, in the first instance, that we should take from the water those heavier particles which admit of subsidence by letting the water remain in a quiet state for some hours. Then, by passing the water through the filter-beds, we should remove those particles that will not deposit themselves, that are too light, and the water would then become bright and pure. The filtration would still leave those qualities which constitute the hardness of water; it would leave those which are chemically combined with the water—the salts. It will remove all those that are mechanically suspended in the water, but not those which are in chemical suspension. After the water has been filtered it will be much softer and much purer than the London water. If the average hardness of the London water is 14°, the Medway water will have about 8° less. I am not prepared to state what the expense of making hard water soft would be, but I believe it is a very expensive process. It involves a great deal of labour and expense to do it effectually.

Cross-examined by Mr. JOHNSON: The test I refer to is Dr. Clerk's test—the soap test. I am the engineer who originally laid out the scheme. I have acted as such in water-works in various parts of England. The whole of my early professional life was connected more or less with water-works, and I was a manager for James Greene, of Exeter; but I have never acted before as engineer-in-chief of a scheme of this sort. I am an architect as well as an engineer. I was connected with the Billington scheme of last year. Mr. Billington was the engineer, and I was associated with him in that undertaking. This is virtually the same scheme. Before I connected myself with it, I examined all the sources of water supply in the neighbourhood. I have not gauged all the springs. I examined the whole of them, I believe, in the neighbourhood. I examined the Aylesford springs, and also the Boxley springs; and from the examination I made, I considered them not to be sufficient to supply the district with water. Besides, I consider that the springs from the chalk are of that hard character that they are not suited for the purpose. You may understand me as stating, as an abstract proposition, that I prefer the river-water coming from the bed of the river Medway to the water from the chalk springs. I live in London, but I have had repeated opportunities of visiting Rochester, and can speak to the want of water. I have examined the Medway water from time to time, and I concur in the opinion which has been expressed, that it is at times a very turgid river. After much rain, at least, it is thick from the matter brought down in its rapid flow. I never heard before that the deposit from the bed of the river is of chemical value in the composition of Portland cement. The materials for the manufacture of Portland cement are brought from various parts, but I never heard that the Medway supplies a portion of the silica. I gauged the spring roughly, in order to ascertain the quantity of water, and I also judged of them by inspection. That was before the deposit of this bill, and also before the Billington bill of last year. I went to the Aylesford springs, and adopted a rather better mode of gauging them than by putting my finger in the water. A portion of the stream runs somewhat in a peculiar manner, and I judged of the rapidity with which it flowed through a given area; and I satisfied my mind, without going further, that the supply from that source would not be sufficient for the purpose. The quantity was so utterly inadequate, that I thought it unnecessary to put up a block to gauge it with precision. I did not examine the Hoborough springs. I do not know that those streams turn mills; but supposing they do, it would not weigh much with me, for they might be sufficient to turn a mill at one time and not at another. It is of great importance that the water supply should be constant, and not fluctuating. The river Medway fluctuates a great deal, but the supply is always ample. The quality of the water, as regards its mechanical impurities, is affected by these fluctuations, but not its chemical properties. In the course of a few hours the quantity of water coming down the river has diminished or increased nearly one-half, from 16,000,000 to 7,540,000 gallons per day. That may be accounted for partially by the passing of barges through the docks in a certain time. There is no doubt that that would tell both ways, and that the surplus water might be occasioned partially by the absence of navigation. But, let the navigation be what it may, I admit that I have noticed a great variation. In some cases, instead of the quantity of water being at the rate of 16,000,000 or 20,000,000 gallons, it would be five or six times as much, and even greater still, after very heavy rains. I made many gaugings; they were continuous, extending over six days. I have not made an average of the result. I do not say there have been no variations; on the contrary, the variations in the quantity were very great. All the results I have mentioned are spread over these few days. The subsiding-reservoir would be filled, partly by the flow of water into it to a depth below the surface of the water in the river, and the remaining portion of it would be filled by pumping. I do not know how long it would take to fill it. Perhaps half a day, but I am not prepared to state the exact time. The cost of the subsiding-reservoirs will be about £7073, which includes every possible expense. I should think it would be necessary to clean them out, perhaps once a month; it depends entirely upon the season of the year. It is very difficult to make an average of such a thing as that, because in the summer time a long period will go by before there is any sufficient deposit to make it necessary to flush out the reservoir. As nearly as I can approximate, it would not be more frequently than once a month. It is very difficult to say what depth of mud there would be—perhaps several inches. I have made an estimate for reservoirs before, and I can see no difference between reservoirs of general character and subsiding-reservoirs, so far as the cost is concerned. The office they perform is quite independent of the cost of their construction. I find my calculation upon experience, and knowing pretty well the nature of the stream with which I had to deal, but not from any experience or comparison with other subsiding-beds. The reservoirs are 13 feet deep.

By Lord LONDONDERRY: The small reservoir would deposit to the same extent as the large one. The depth of water being similar, the subsidence would be equal, yard by yard, at the bottom, in a given time. A well of 13 feet deep would subside as quickly as these subsiding-reservoirs, which contain millions of gallons of water, the vertical column of water being the same.

By Mr. JOHNSON: There are a series of filtering-beds—three of them, one beside the other. They are calculated to give an area of filtration to 2,000,000 gallons of water per day; they form, in fact, a portion of the larger reservoirs, as shown in the map. They would be in extent 2666 square yards, and a square yard of filtering-bed would filter, perhaps, about 800 or 850 gallons per day. The capacity of the filter-beds is not important; it is the superficial area of the filter-beds themselves. The process is to pass the water constantly through the filter-beds, from the subsiding-beds, at a given rate. The filter-beds would all be in operation at once, but it would be competent to draw the water of one while it was being cleaned, and the other two might then do the work. They are so arranged that they can be used separately. The total amount for the three filters is £2200, which is included in the £7073 I gave as the cost of the lower reservoir. We propose to use gravel and sand for the purpose of filtration. We do not propose to use charcoal, because we do not think it will be necessary; but, if it were, there would be no difficulty at all in applying it to the same filters. It would be a question of working expenses. The horse-power proposed is 157, which will be divided amongst three engines. These engines will be able to do their work, and raise 2,000,000 gallons of water in about twelve or fourteen hours. The total length of pipe, from the filter-beds to the farthest point of our supply, is about 13 miles. It is an undulating section. The greater the length of pipe the greater the cost in working, no doubt; but the length will make no difference in the time which the water will take to deliver itself, provided the gradients are uniform. The friction per mile of the main would not be more than 7 feet. The engine power should be sufficient to raise the water to such a height as will overcome the friction; either that or the reservoir should be at a sufficient height to do so. The expense would, perhaps, be about the same, and the effect would be similar. We calculate our supply at 24 gallons per head for the population. I do not mean that each person would consume 24 gallons of water per day, but this quantity includes the whole wants of the district—brewing, street watering, &c.

By Mr. CHAMBERS: The height of the reservoir at Farleigh Lock is 266 feet. The city boundary is 99 feet lower, and the length of the pipe is seven miles. The distance from the reservoir to Brompton and Gillingham, I should say, is between 10½ and 11 miles. I do not know the exact height of Brompton. That place would be supplied from the Rochester reservoir. I have made allowances for all the difficulties of transit. I cannot give you any particular instances of complaint at Brompton and Chatham about the water supply, but I understand generally that the supply is not constant, and that many people who wanted water could not get it. I do not know whether they are in communication with the existing company's mains. I do not know that the company have a contract for supplying the public works at Chatham. I have assumed that the cost of cleansing the filtering-beds will be £100 per annum as to labour. It is the mechanical cleansing that I speak of, and it can be done with very little labour. I take no credit for the sale of the mud for the purposes of the Portland cement manufacture. I have provided for a service-pipe of four inches bore into Brompton and Gillingham, which I think will be quite enough for the purpose. I estimate the population of the district to be supplied at 85,000.

Re-examined by Mr. CALVERT: Thirty years ago I was connected with the Wakefield Water-Works, under Mr. Billington. From that time to this I have been much engaged with that department. Their lordships are indebted to me for the arrangement of the supply of water to the Houses of Parliament. I had a great deal to do with the water-works at Exeter. The gentleman I was with was engineer to the county, and the water-works came under my superintendence. I was fourteen years engaged in those works. I was co-engineer with Mr. Billington last year. I am acquainted generally with the evidence given before the committee on the Aylesford springs, but I was not in the room during the whole of the time. It is not always the case that the smaller the quantity of water the purer it is, because, though the large quantity coming down the river may be more thick, it may yet be really purer than the smaller quantity. I said it would take about half a day to fill the reservoir; but it does not particularly matter whether it would or not, as it is a continuous process, to a certain extent, and during a great portion of the year it would scarcely be necessary to subside the water at all. The arrangements and estimates, and all the items, were submitted by me to Mr. Hawksley. The expense of using charcoal in addition to sand and gravel, should it be found necessary, would not exceed £40 or £50 a month. It might be necessary to renew it once a month; but

in my opinion it would not be necessary to use charcoal at all. Having regard to the pressure, we have sufficient height at what is called the Rochester reservoir to supply the whole of the district. Chatham Hill is very much above Brompton, and our works are high enough to reach Chatham Hill.

Mr. *Henry Hughes*, examined by Mr. CALVERT.

I, in company with the clerk to the Maidstone Commissioners, and Mr. Barling, a gentleman residing in Maidstone, took some samples of water to Dr. Miller. We were instructed to do so by the committee appointed by the Pavement Commissioners. We took fair samples from the places pointed out to us. The first were taken to Dr. Miller about the 20th or 21st of September. Dr. Miller required further samples, which were taken about a week after. He was not informed as to the locality from which they were taken. The samples were indicated by numbers. Dr. Miller forwarded a report and tabular statement, a copy of which I see in your possession. The samples were numbered, 1, 2, 3, 4, 5. No. 1 was taken at Tunbridge, at the place where the supply for the Tunbridge Company is derived in the Medway. No. 2 was taken at the spot where the proposed works are to be. No. 3 was taken from a stream issuing out of the Allington spring, in the parish of Aylesford. No. 4 was taken out of the Fairmeadow at Maidstone; and No. 5 from the same meadow, but it was an old one.

Dr. *Miller*, examined by Mr. CALVERT.

I am Professor of Chemistry at King's College. Last autumn I received some samples of water from the Maidstone Pavement Commissioners. I made an analysis of these samples, and furnished a statement of that analysis to the commissioners. That statement is embodied in the tabular statement produced. I cannot answer that every figure in that table is correct, but certainly in the main it is so. I do not know the localities from which the samples were taken, I can only speak of them by their number. The best sample I examined was No. 2 I should say it is very good water for domestic purposes; there is a small quantity of carbonate of lime in it, but the quantity is very little more than five grains in a gallon. For manufacturing purposes, the less carbonate of lime there is the better, because it would cause a crust to form on the inside of the engine-boiler. Comparing No. 2 with the London supply of water, I find that the London supply, which varies greatly in hardness, but which, perhaps, averages 14° or 15°, is considerably harder. The sample No. 2 is not only softer, but it is freer from organic matter than most of the London supply. Sample No. 1 is very close upon sample No. 2; it is rather a softer water. The others are very inferior—in fact, some of them could not be used for a domestic supply. Samples 4 and 5 are particularly bad. No. 3 is a hard short water.

By Mr. CHAMBERS: I have not analyzed the Luton water.

Mr. *Charles Lucas*, examined by Mr. CALVERT.

I am a member of the firm of Lucas, Brothers, contractors. I am well acquainted with the present scheme, and I am prepared to undertake the contracts for the works. We have had considerable experience in works of this description in many parts of England, and we have only had one failure. That arose from the failure of the supply from a well, and we had to go about seven miles further on to the river to get the water. This was at Lowestoft, in Suffolk. We were in hopes that, by sinking a large well, we should have an ample supply: but it turned out to be a complete failure, and we went for a fresh supply down to the river.

Cross-examined by Mr. CHAMBERS: I have supplied large works from wells, but they have been so far unsatisfactory that in any case we should never put any of our own money into them.

Mr. CALVERT: That, my Lord, is our case.

Serjeant WRANGHAM said there now remained three bills to be considered: two of those bills constituted one scheme, and made one interest. They stood first on the paper. One of them proposed to supply Maidstone, and the other took the towns at the other end of the line—Rochester, Chatham, and so forth. Then there came the last on the list, "The Medway Valley Scheme," which covered the whole of the ground occupied by those two. He did not think their lordships would see any reason for departing from their usual custom in permitting the bills to come on in this order; so that the two bills which make one entire scheme might come on first, and the Medway Valley scheme be considered last of all.

Mr. CHAMBERS objected to this on the ground that the committee had decided to take the two competing schemes first.

Some discussion followed, and eventually it was decided to take the Medway Valley scheme first, and that Mr. Serjeant Wrangham should have the right to reply as against the two remaining schemes.

Serjeant WRANGHAM then proceeded to address the committee upon the Medway Valley Water Bill. Having alluded to the number of the bills now before the committee, and to his right of reply to the remaining schemes before their lordships proceeded to decide on the case, he said that one point might be so far taken for granted, that it would need no effort of his to establish it it—viz., the necessity for this new water supply. The very fact that there were four bills before Parliament for the same object, was a convincing proof that the result sought to be obtained was one of great public necessity. The simple question that remained was, which of the schemes now before the committee was the best? There were, in fact, only three schemes; for, although it might be said there was a district of several miles in length, which was not supplied by the two smaller schemes, if united, yet it must be borne in mind that that district consisted of villages, and a thin population which did not require any very considerable quantity of water, and would not be much affected by either scheme. Substantially, therefore, there were but three schemes for the supply of the district having Maidstone at one end, and Rochester and the cluster of towns at the other. The bill for which he appeared, covered the whole of the ground. He felt that his case would rest mainly upon the evidence he should offer to their lordships, and that it was not a case for a long speech, inasmuch as it involved questions of fact, which the committee were quite competent to judge of. The point to be decided was, which afforded the best mode of supplying water? In looking at this question, one great feature to be considered was economy, for the poorer classes of society were those who wanted most water, and could least afford to pay for it; so that, the cheaper the supply could be conveyed to them, the more likely it was that they would be able to avail themselves of it. Both for sanitary purposes, and for the sake of cleanliness and comfort, it was very desirable that the supply should be within the means of the poorer classes. The scheme for which he appeared passed by the turbid and contaminated waters of the Medway, which required subsidence and filtration, and all that additional expenditure, which enhanced the price of the commodity when finally supplied to the consumer, and proposed to take water from the streams which lay pretty nearly half way between the two extremities of the district. They believed they could do this for far less money than by the scheme which had just been laid before their lordships, and they would be able to furnish to the inhabitants a supply, ample in quantity, excellent in point of quality, and cheap in respect of price. Although various schemes had been devised for supplying this great want, none had as yet succeeded in conciliating the spirit of both Houses of Parliament. He believed that at the Rochester end there was no supply of water from any but private sources. Maidstone was, if possible, in a still worse predicament. He was told that there were some remains of some stand pipes which were furnished by some public body, and from which a little water was to be obtained; but that little was so much needed, that the population of Maidstone rose early in order to get the first of the flow. The water was exhausted while the day was yet young, and he was told that householders or their servants had to rise at five o'clock in the morning, to be amongst the first to be supplied from those pipes. He would dispose of the ordinary part of the questions, by stating the money arrangements which were proposed. They proposed to start with a capital of £50,000, with borrowing powers to the extent of £16,600. The estimate for the works was £50,000, including purchase of land and compensation. They proposed to go for their supply to certain springs lying midway between Maidstone and Rochester. The springs they proposed to take were, first of all, three springs in the parish of Aylesford—viz., Tottington, Springhead, and Cussington, all of which gave a very copious supply of very excellent water. On the opposite side of the Medway, travelling towards Rochester, there were very abundant springs at Hoborough and Snodland, which they proposed to take. They intended, if they obtained their bill, to sink a well, 250 feet deep, at Aylesford, from which they would derive an addition to the three springs; and a reservoir would be made in the same field in which the well was situate, and where the pumping-station would be. At Hoborough, the works would be stationed at the mill-head. The mill was supplied by springs which collected in the natural basin, and it was not intended to injure the mill by the company's works, as the water would be taken after it had passed over the mill-wheel. The water would be conveyed, through a brick conduit, to a point where it would meet with a conduit from Snodland spring, and be carried forward to the works, which were indicated in the plan by the letter "G." A small conduit or pipe was to be carried under the Medway from the point of junction to the point indicated by the letter "K," where a pumping-station would be erected, from which a portion of the water will be conveyed in main-pipes to the town of Rochester, and some of it into the reservoir before mentioned in the parish of Aylesford, and added to the water obtained already from the three springs in that bed. Having thus explained his scheme, the learned counsel proceeded to point out its advantages over the rival Medway undertaking. First of all, he said, the reservoir being nearer would enable them to convey water more cheaply to Rochester, the distance being less, and the pressure required to send the water home being also less. Not only so, but the reservoir was at a considerably less elevation. The maximum lift of the Medway scheme was 320 feet, that of the Medway Valley 230 feet, or 90 feet less. He would not detain their lordships with any remarks about the quality of the water, as that was a matter solely for evidence. There was another great expense connected with the Medway scheme which they would escape. He alluded to the enormous works necessary to purify the water before it could be fit for domestic use. The water which his clients proposed to take was already filtered naturally, and came to hand pure spring water. It was difficult to estimate accurately what additional expense would be involved in the process of purifying. £7000 was already spoken of as the expense of the subsiding and filtering reservoirs, and £16,478 as the total expense of the reservoirs. On the other hand, the expense for reservoirs in the Medway Valley scheme would be only about £6000. This was a very important consideration, when it was reflected that the cheapness of the water was of great importance to the class of people who most needed it. A saving of £10,000 in the mere matter of reservoirs was a very important question, and it would require very strong evidence, he thought, to satisfy their lordships that the difference in the quality of the water made it necessary to incur this increased expense. In addition to that, there was an annual expense of pumping. The precise expense of this operation was not stated, but it was only reasonable to suppose that it would be much more costly to pump the water up to an elevation of 320 feet, than it would be to an elevation of 230 feet, especially when it was considered that 2,000,000 of gallons per day were required to be raised. He believed the difference of 90 feet in the height of the reservoir would occasion a considerable additional annual expense, as well as the expense of the construction of the original works. With respect to the schemes promoted by his learned friends, the common serjeant, and Mr. Hope Scott, as he should have an opportunity of making some observations upon them after their case had been submitted to the consideration of the committee, he would not trouble their lordships with any remark upon these bills. In fact, the information which was contained on the face of the bills was so scanty, that he felt it difficult to make any observations upon it. The means and the source of the supply of water were not stated; they were left in the dark on these points, as far as the bill was concerned. Some petitions had been presented against the bill which he had the honour to advocate, and these petitions all referred to one alone out of the five springs he had mentioned. He believed they all referred to the Tottington spring, one of the three springs in the parish of Aylesford. They were presented by the inhabitants, owners, lessees, and occupiers of land in Aylesford parish and neighbourhood, and they all complained of taking Tottington spring. This, at all events, was pretty tolerable evidence that Tottington spring was very good water, or else they would not be so very anxious at the company proposing to take it. The petition coming from Tottington was signed by 43 persons, and one of them was a gentleman of the name of Peters, who also presented a separate petition. In this petition, the nature of the works was quite misapprehended, and he did not believe the company would attach any very great importance to it. The petitioner said that he was the owner of a valuable chalk farm in the neighbourhood, through which the company proposed to carry a pipe. The petitioner complained that he was seriously damnified in respect of the chalk underlying the pipe, which he would not be able to excavate. The company would be very sorry to do any damage to the owner of this farm in respect of this chalk, because, whatever damage they did, they would have to pay for; but the committee would have to judge whether that damage was likely to be very serious, after all. The company proposed to lay down a pipe alongside of a public footway which crossed the farm, from which it was clear the chalk could never be taken, or the footpath would fall in. It was, therefore, very clear that the company would not interfere with any chalk which Mr. Peters would be entitled to take, and it was difficult to say in what respect he would be damnified. There was a third petition, from eight persons, also complaining of the taking of the Tottington spring; and this constituted, with the others, the whole of the petitions presented against his scheme. He had omitted to mention one from the South-Eastern Railway Company with respect to a pipe which was carried under their line; but he believed the parties had come to an understanding that means should be taken to insure the railway from any possible damage which could arise. Owing to

that circumstance, he did not think the railway company had entered an appearance on their petition, and he believed they were perfectly satisfied with the clause that was proposed to be inserted in the bill to meet their case. He now believed he had said all that was necessary in securing the general features of the plan, for which they now asked the sanction of the committee; and every other point which was necessary for determining its merits would proceed from the witnesses whom he would now call.

Mr. *F. G. Holman*, examined by Serjeant WRANGHAM.

I am a surveyor and house agent, and reside at Rochester. I am well acquainted with the house property of the town, having lived all my life there. With the exception of a small supply of water from a brewery in the town, there is no water supply for the inhabitants. That water comes from a deep well. The supply is wholly inadequate to the demand, and to the comfort and cleanliness of the inhabitants. The water which is obtained from wells in the town is principally brackish, in some parts much more so than in others. On the right hand side of the street, the water is so brackish, that it cannot be used for domestic purposes; it is also far from pure. As to quantity, it varies very much. In the summer, it frequently runs very short indeed; and in times of drought we can scarcely get enough to use. The inhabitants of Rochester are greatly incommoded, in consequence of the deficiency of water. My own opinion with regard to the river Medway is, that the water obtained from that source is not at all fit for the purpose required. Where I live, the Medway water is quite salt. I believe it is liable to considerable floods. As far as I am concerned, I should object to having the water from the Medway so long as it could be got from springs. In case of fire at Rochester, it is exceedingly difficult to get water. I have never seen a fire in which there has not been considerable damage occasioned to property from the want of water. The only way that we can get water, is by bringing it in brewers' drays from Chatham. The supply in the wells has invariably failed, after pumping for half an hour. I mean after the engines have been so long at work. This has been the case whenever a fire has occurred.

By Lord MIDLETON: We have no means of getting water upon these occasions from the river. There is a large intervening space between the inhabited part of the town and the river. In some places, it is as much as 400 or 500 yards, and in other places a quarter of a mile.

By Serjeant WRANGHAM: The deposit from the river Medway is of such a character, that it is used in the manufacture of Portland cement. There are some works directly opposite the town of Rochester, where they use the deposit of the river, which is of a blue colour. There are other cement works in the neighbourhood, and the blue mud is taken in barges to the different cement works; at least, I believe so.

Examined by Mr. VENABLES: Strood is on the other side of the Medway, and is not so densely populated as Rochester; there is, however, a considerable population there. The town consists, on the whole, of an inferior class of houses. I have no notion what the population of Stroud is. The South Eastern Railway station is there. The town is increasing, but not so rapidly as Rochester. I believe it is supplied with water from the top of Stroud Hill, where there are small water-works. It is not in my knowledge that the company which proposed to take water from the river Medway includes Stroud in its supposed supply, nor that the Medway Valley Company does not. I know the villages on the banks of the Medway, between Rochester and Maidstone. There is a pretty considerable population in connexion with the lime works, but there are not many buildings going on, and the population increases very slowly. I do not know that the Medway River Company proposes to supply these villages. I knew nothing of their plans before I came here to-day. Aylesford is a pretty considerable village.

Mr. *James Bassett*, examined by Serjeant WRANGHAM.

I am a solicitor, and the treasurer to the Corporation of Rochester. I have heard Mr. Holman's evidence, and I concur in what he has said. There are cement works opposite the town of Rochester, which will shortly be opened. The matter which is deposited in the bottom of the river is useful in the manufacture of cement.

Joseph Gibbs, Esq., examined by Serjeant WRANGHAM.

I am a member of the Institute of Civil Engineers, and have been largely employed in engineering works in various counties. I do not combine with my profession that of architect. I have been largely employed in hydraulic works. I have directed works of very great magnitude. I am well acquainted with the district affected by these plans, and I have been acquainted with it for a long time. I have ascertained its geological features, and the sources and course of the springs and streams. I have applied myself more especially, with reference to the present measure, in prosecuting inquiries of that kind. I was asked to support the scheme, which proposed to take the water in the Medway. I examined the plans of the company, and I recommended them to take the water from the springs instead, on account of the variable character of the Medway water and the river being so liable to floods. It is not a spring river, but a flood river. It flows from the Weald, and in its course passes through a great deal of timber land, which is very apt to colour the water, and to make it opalescent. It also flows through a large agricultural district and hop country, where a large quantity of manure is used. All these considerations induced me to look to the springs, and I recommended the company, after they failed upon the standing orders, to abandon the idea of taking the water from the Medway, and to get it from the springs. All flood rivers are discoloured more or less by vegetable matter. The clay of the Weald is very soluble, and also affects the water. I do not think it is possible to remove this discolouration by filtration. Filtration involves considerable constant expense. There is first the expense of construction. A reservoir has to be constructed of stone or brick, with open spaces for letting the water through; and the filter-beds are made of sand and gravel. It is necessary to cleanse these beds at intervals, the frequency of which would depend on the state of the river at any given time. In this case, the Medway River Company propose to have subsiding reservoirs, to remove the grosser impurities. A great portion of the clay, silica, and alumina would be taken into the filter-beds. I do not think charcoal is admissible as an agent in such large works as are contemplated here. Companies would not give themselves the trouble to repeatedly change it. The expense of doing so would also be great. Charcoal is of value because it absorbs the inorganic matter; but, after it is once charged, it is of no further value until it is put into the fire again. That would be another source of great expense. After the charcoal is charged, it is efficient as a filter for ordinary filtrations, but not for the purpose for which it would be employed. It would necessitate a great outlay, if used upon a large scale.

By Lord LONDONDERRY: I can conceive of circumstances in which companies might give themselves the trouble to change the charcoal—for instance, where the water is very impure, and pure water is not to be obtained. But, I think, in ordinary cases, neglect would supervene and the charcoal would cease to be used; I cannot, upon the spur of the moment, give you the relative cost of charcoal and gravel in these large quantities, but gravel would cost, perhaps, 1s. per ton, whilst the charcoal would cost about 1s. per bushel.

By the CHAIRMAN: For domestic purposes, I would decidedly recommend charcoal to be used in addition to the gravel and the sand, but charcoal would cost more pounds than sand and gravel would shillings. After being once charged with the nitrogenous gases, it would simply be a mechanical filter. It will absorb a large portion of gaseous matter if it is exposed to the air for a short time prior to its use. For domestic uses, it might last a week, perhaps.

By Serjeant WRANGHAM: In this case, I do not think it reasonable to employ the capital of the company in taking dirty water, and making it clean.

By Lord DUNGANNON: Of course, it would be different if this were the only source from which water could be had, but it would involve a very reckless expenditure.

By Serjeant WRANGHAM: It would very considerably enhance the price to the consumer, and there ought to be two sets of mains, one to supply water for the roads and other purposes, and another to supply water for the inhabitants. The company with which I am identified, proposes to take the spring water which lies upon the bottom edge of the chalk, where the chalk comes in contact with the green sand. There is a stratum called galt, which is impervious to water, and throws the springs out. The springs which we propose to take, lie nearly midway between the town of Rochester on the one hand, and that of Maidstone on the other; and, for present uses, we may take the population of those places as pretty equal. Maidstone, at present, is smaller as regards population, but very shortly will be the larger of the two, as it is increasing very rapidly. We also propose to take water from the Hoborough and Snodland springs. The Hoborough spring rises in a basin where the water is pure, and then turns a mill-wheel; and we propose to take it at the foot of the mill. Snodland consists of a number of springs, which issue partly from the chalk, and partly from the green sand. There is a paper-mill there, and we go a considerable distance up the stream to take the water out of the influence of the paper-mill. The water will be conveyed to the intermediate points by brick culverts, and thence it will be passed by a pipe under the river Medway to the pumping-station, from which we propose to supply Rochester, and where our reservoir will be situated. The water which is not wanted for Rochester will be sent along the pipe to the other pumping-station. We propose to sink a deep well considerably above the level of the springs at Aylesford, and then to drive an adit to the springs, should it be necessary; but I do not believe we shall require the adit, because we shall tap the springs at a lower level. The chalk hills are gathering grounds for the water. The pumping station, from which we draw the water, is 250 feet high. We have another pumping station at the Hoborough works, which is still higher, because the springs are lower. The height of the reservoir above high water mark is 243 feet; but our lift from Aylesford springs is only 155 feet. The lift at the Snodland reservoir is 263 feet. One set of springs is situated higher than the other. Our reservoirs are so placed that we can supply the towns, at either extremity, by gravitation. There is no doubt we can obtain a very large quantity of water. We expect to supply at once, 60,000 people, and we have calculated the supply at thirty gallons per head, per day. This will make 1,800,000 gallons per day; and, supposing twenty gallons per day to be sufficient, we should only require 1,200,000 gallons. That would depend upon experience. I am convinced that the supply would be adequate. I have had the springs gauged, in the driest weather during last year. I did not gauge them roughly, but through notches in the ordinary way. We do not consider anything gauging except we put up a bar across the stream, and make an opening, of a certain depth and width, through which the water can come. I have made an estimate of the costs of our works. They are estimated to cost £49,908. £50,000 is the amount of share capital we propose to raise, and we propose to have borrowing powers for £16,600 more. I am aware that there is a petition from the inhabitants against our taking Tottington spring, but I am confident that we shall be enabled to do without that spring, and still have an ample supply of water. I am convinced we can get double the quantity of water; but I have calculated what is actually within eyesight, without digging. We can afford to let Tottington spring go out of our plan altogether. My highest calculation is 1,800,000 gallons per day; and I am told that we shall be able to supply that, even without Tottington spring. We can raise more than 2,000,000 gallons, according to my estimate. We want 156 horse-power, which, at £100 per horse-power, would make a total of £15,600. The pipe is estimated to cost £17,298. Its length is 17,180 yards, and its diameter 18 inches. The cost of the adit will be £1087: but I should say that that sum will never be required, and I have a great deal to do with underground works. It is only a precautionary measure, in case it should turn out that we should require it. The brickwork in the reservoirs is estimated at £4650; I should state that the reservoirs are cut in chalk, and that the brickwork will consequently be much less than would be required, if they were cut in a less resisting material. The chalk will not give way under the pressure of weather, frost, &c. The estimate for the culverts is £4149; the excavations in the reservoirs are estimated at £1192 for 23,850 cubic yards. The excavations for the conduits are estimated at £341; and for the addit at £90. 10s. The length of the adit is 725 yards altogether. The wrought-iron pipe under the river I have put down at £1000. That will probably not be all expended on the pipe, but I have left a margin for contingencies. The Admiralty have made no objection to the pipe going under the river. For land easements, compensation, &c., we estimate the cost at £4500. We go along the highway generally, and take but a very small portion of land. The compensation includes that for the taking of springs, and all kinds of damages. We go through no rights of way. With the exception of the Tottington petitioners and Mr. Peters, no person connected with the property in this district objects to our scheme. I know Mr. Peters' farm; it is a chalk farm. He works chalk-beds, but the workable chalk is not where we go. A footpath goes across the farm, and I understand Mr. Peters disputes the right of the public to go along the footpath. The public insist upon their right, and people will go. It is only in case Mr. Peters should succeed in defying the public right, that we can be said to take the footpath; and, even in that case, the damage to Mr. Peters would not be very considerable. I have been employed in railway works in this district for many years, and I am thoroughly conversant, not only with the geological characteristics of the district, but with the soil. There is a very great need of a water supply throughout the district.

Lord DUNGANNON: That seems to be admitted by all parties. The only question is as to the best mode of supply.

Examination continued: I gave evidence before the committee last year, upon the Medway bill. Mr. Hawksley gave evidence in support of the bill. It proposed to take the Aylesford springs. It was generally felt last year that the scheme was not sufficiently comprehensive. We believed, at that time, that we should not have met with any counter scheme. We only had

to consider the best mode of supplying the district. Mr. Simpson and myself went over the district, and we came to the conclusion that this was the best and most comprehensive scheme that could be adopted. I had recommended the company to abandon the river scheme, and to withdraw their bill rather than to promote the river scheme. I had been called upon at Cambridge to give evidence in favour of taking the river Cam, but I found that it would be much preferable to take the spring water in the neighbourhood instead, on account of impurities and discolouration of the Cam water. I recommended the promoters of the scheme to abandon their plans, and to look to the springs which were situated in the chalk formation, precisely as these are. My scheme was adopted. It was the Cherry Hinton scheme, and the works were constructed by Mr. Simpson, and they answered the purpose admirably. With regard to the two remaining bills before their Lordships I only know that it is proposed to dig wells twelve feet deep in the vicinity of the Medway, and to derive the water from the wells. I heard that in evidence before the committee on the standing orders, and it is all I know about the bills. I have taken the section at the places indicated, and I believe that water would come into those wells from the river. In my judgment, therefore, the scheme is altogether objectionable. It would be slightly superior to the larger scheme, inasmuch as the water would flow into the wells by a natural process of filtration, whereas the other bill proposes to perform the filtration by artificial beds. As to the quantity derivable from such a source as that, it must be a matter of mere speculation until the wells are sunk. Unless pits should be opened, and tested by pumping, there could be no means of ascertaining what quantity of water could be got by this means. It might happen that, after sinking the wells, they would find no water; but I think that the Medway water would flow in. There is a company formed under the Limited Liability Act at Luton, but I do not know the amount of capital employed in it, nor the quantity of water they raise.

Cross-examined by Mr. VENABLES: The chalk formation lies towards the north, with a very steep escarpment towards the river to the south. The chalk also appears at Snodland. The dip of the chalk is N.N.E., and it slopes gradually towards the Thames. There is a small portion of upper green sand between the chalk and the gault. The green sand rises up in great force towards Tunbridge, and occupies the country between the Chalk Hills and the South Downs. The Medway, through its entire course, touches no chalk until it comes to Snodland. There is a branch of the Medway that issues at Oxted, but the great body of the fresh water comes from the green sand and the Wealden clay. All the springs in the neighbourhood come from the chalk, except Snodland, which chiefly issues out of the green sand. There is a great thickness of chalk at Aylesford. I do not think the Medway water is purest when low, as there is a great deal of sedgy matter in it. It is clear, but there is a good deal of vegetable matter in it. It is not discoloured by peat, nor by anything similar. I think some of the discolouration cannot be removed by filtration, but I have not experimented upon it. I did not prefer river water to spring at Southampton. There was there a beautiful spring which the company wished to take, in preference to the river Itchen, but we were opposed by the proprietor, and compelled to take the river. (Counsel read portions of Mr. Gibbs' evidence before the Southampton Committee in 1852.) The promoters of the Medway Bill are quite right in proposing to filter their water. I do not consider it necessary that charcoal should be used. The charcoal will last for an indefinite time, if not exposed to the air, provided it be recharred at stated intervals. I do not know the precise hardness of the Aylesford springs. A certain degree of hardness is desirable. If there are 30 degrees of hardness in it, it would be very objectionable. I do not think the Allington spring rises under the same circumstances as the Aylesford. I did not look to it, as it was not of sufficient volume for our purpose. The Allington spring rises from the chalk. I had no particular instructions to go to one spring rather than another. Boxley spring is not applicable to our purpose. It is one of the feeders of Allington. The Ledsing spring would be much harder than the Aylesford because it rises in the green chalk. It is possible to precipitate the carbonate of lime by Dr. Clerk's process. This would necessitate a constant working expense, similar to filtration. I imagine the water is well adapted to domestic purposes, because the Tottington people petition against our taking it. I cannot give you the separate gaugings of the different springs. I had them taken separately, but have not the particulars with me. None of the springs we propose to take have ever ceased to flow that I can ascertain. Snodland is a town. There is a steam-engine at Cussington, but it has nothing to do with the spring. One well at Aylesford will go through the chalk. (Witness described what the construction of the adit would be, if it were found necessary to make one. The learned counsel examined him with a view to elicit that, sinking the well would of necessity draw the water away from Tottington spring, but the witness contended that it could be prevented, and that it would not be allowed to do so. It was possible to sink a well four miles off which would tap the springs. The learned counsel directed witness's attention to his evidence on this subject last year before the Lords' committee, but witness explained that his statements were perfectly connected one with another).

By Mr. CHAMBERS: These springs have been claimed by Mr. Betts as his property. I have not heard that that gentleman claims £30,000 as compensation for taking them. I decline to give details as to my estimate of the compensation due to him. We have had no opposition from Mr. Betts. I have not heard that he says he will be paid if these springs are taken. I have assumed to pay him a sum down. We take eight acres of land. All three of the Aylesford springs belong to Mr. Betts. We stop a mill at Cussington. I have included that in the compensation. He has not asked £7000 to my knowledge. I do not know that Mr. Betts has asked £600 a year. The soil where you propose to sink the wells near the Medway is diluvial. I do not know that you would come into the green sand at 13 feet. The green sand would be saturated with the water percolating through it from the Medway. I have not made experiments to ascertain what supply you could obtain from the wells.

By the CHAIRMAN: I could sink the well at Aylesford to a depth that would draw Tottington spring. What I said with reference to the well four miles off was, that it would disturb the water level of the district. I was not retained last year to give evidence on the subject by Mr. Betts. I gave my evidence generally. There are no indications of chalk being worked where our pipe is at present over Mr. Peters' property. We should only take a thin strip of land. The Admiralty regulations would be complied with in respect of the pipe under the Medway. We propose to lay the pipe 40 feet below the level of the river, and to use a wrought-iron pipe, rivetted. It would be in our power to tap Tottington spring if we chose to do so.

Re-examined by Mr. Serjeant WRANGHAM: We put our pipe along the foot-path over Mr. Peters' property. Thirteen feet of depth at the wells for the Maidstone scheme would not give a sufficient supply of water. There would not be a sufficient cone. In times of heavy floods, river-water becomes opalascent.

THURSDAY, MARCH 8.

James Simpson, Esq., examined by Mr. JOHNSON.

There was a scheme set on foot for getting water from the Medway at one time. I approved of it, and it was going on, but it was stopped last session. At that time I had not become acquainted with the springs which this company are now seeking to adopt as their sources of supply. It appeared to me that those springs were occupied, and there would be a difficulty in getting them. Subsequently to that time I went with Mr. Gibbs, who took proper gaugings. I believe there is a sufficient quantity; and as to the quality, I tasted it, and satisfied myself upon that point. Though commonly called hard water, it is not so, because engineers understand by hard water that which is above 16°, and this is less. I believe it to be, in point of hardness, like the London water; it is beautiful spring water. It is very similar in character to the Cambridge water. I was the engineer at the works at Cambridge, and I drew the plans. There was an immense objection to the Cam water, so much so that I saw there was no hope of stemming the torrent, and I gave way, and turned my attention to the springs. With reference to Maidstone, I recommended Mr. Gibbs to adopt that plan; it seemed to be the best. I not merely approved the scheme, but it was propounded between us. I gave what assistance I could. I confirm the estimate of the cost made by Mr. Gibbs. I have been accustomed to work such estimates in different parts of the world. It would be a very expensive thing to purify this water with charcoal.

The CHAIRMAN: I do not think the promoters of the first bill mentioned charcoal as necessary.

Lord DUNGANNON: They merely made a comparison between charcoal and other things, but they did not say that charcoal would be necessary.

The CHAIRMAN: Of course charcoal would be a very expensive proceeding?

Witness: I have no doubt it would cost £1000 a year to purify with charcoal 1,000,000 gallons a day of the water taken from the Medway. After a time, however, charcoal is of no use for this purpose. I have used it in the laboratory by way of experiment, but upon a large scale there is great waste. To raise the water to the additional height of 65 feet, it would require about 40-horse power, and the annual cost of working would be about £600 a year. I have known the Medway waters many years. At certain seasons its quality is very good, but floods are very frequent—more frequent than in many other rivers. Even in the height of summer I have seen it flooded. There is no doubt that it would be a very difficult thing to get bright water at all times, and it would be very expensive whatever process was employed.

Cross-examined by Mr. CALVERT: I approved at one time of Mr. Billington's plan, which I think was something identical with that of the promoters of the present scheme. It was for the purpose of taking the water from the Medway. I do not remember that it was a part of that scheme to use charcoal. There was always a great difficulty in filtering that water. I think this water was recommended by the Metropolitan Commissioners or the Board of Health. There was a strong feeling at Maidstone against the use of the Medway water. They said, "We won't have that water." I do not remember that, coupled with that declaration on the part of the town, there was an intention to bear the expense of the supply. I do not know that it was the plan of the Maidstone Commissioners to take the Medway water. I understood they were open to receive any plan that might be brought before them. There were a great many reports at the time. I do not know that the great struggle at Maidstone was whether the town should bear the expense, or whether it should be borne by a private company; but I have heard a variety of reports, having been in the habit of going to Maidstone for many years, and being employed for two years there in gauging springs. I dare say I have heard that topic mentioned as well as a great many others. I do not know, from my own knowledge, that it was a question agitated in the town for several years. Mr. Gibbs requested me to go with him to Maidstone; the solicitor also asked me to go, Mr. Baxter; but I saw Mr. Gibbs first. I did not understand that I was then employed on behalf of the company, the matter being then in embryo. Mr. Gibbs came to me and explained the scheme in a very rough way. I believed there was then no company formed at all. The Cam water is very hard, it being impregnated with chalk. In spite of the difficulties and the opposition in the town, I was at one time inclined to take the water from the Cam. I did not know any other source at that time. If there had been no other source, I should say that water would have been good enough, as far as quality was concerned. There had been objection to using it for drinking and culinary purposes on account of the mills upon it. The Cam is purer than the Medway. I do not know that the mills between Tunbridge and Farleigh are calculated to injure the quality of the water. I have seen the water at Farleigh Bridge filtered after a heavy storm. The result was not at all satisfactory. I took it myself. That was last July. There is no doubt the Medway is very soft water. After I had filtered it in the case I have mentioned, at the end of twelve hours I put it through filtering paper, and so turbid was it that, on the third piece, the colour was discernible. That convinced me that no ordinary course of filtration on a large scale would enable people to use that water at all times. It is, in fact, the same with the Thames water at some periods. I find the same thing with the water at Kingston, which supplies Lambeth and Chelsea. But the Medway is far worse; it has so many colours. You get yellow and green and brown. In the filtration of water through chalk, it does not, correctly speaking, descend vertically, but still it has always a tendency to descend. Supposing there were a succession of springs, one above another, the one at the top would be exhausted first, assuming that there was no strata intervening to divert the water. I examined the gaugings of the springs taken by Mr. Gibbs. The quantity from the Snodland spring was much larger than the others, between twice and three times as much.

By Lord LONDONDERRY: The water supplying Cambridge was not taken from the Cam, but from springs instead. There is no operation necessary to diminish its hardness. So far as my experience goes, I should not recommend such a process. I do not believe that the water of the Medway would afford to the inhabitants as good water as springs until some great alteration is made, the river being sometimes in so turbid a condition

Mr. *Gibbs* was then recalled, and read the gaugings of the different springs taken by his assistant, by which it appeared that Hoborough yielded 540,000 gallons a day; Snodland, 1,120,000; and Cussington, 320,000.

Cross-examined by Mr. HOPE SCOTT: It is not the case that Snodland water is made up partly of the tide. It is not let in for the purpose of being directed by the miller against the wheel. The 1,120,000 gallons a day come from water higher up; the gauge was taken higher up, more than a mile above the mill. It is a stream-mill not a tide-mill. No part of the water which works the mill comes from the tide. I certainly take upon myself to say that. It is a spring derived from a number of small springs coming from the green sand, some of them five miles above, or even six or

seven, while others are not more than three or four. Those rivulets do not bring down the drainage of the country, except, of course, agricultural drainage from a very narrow district. I do not propose any filtration. There is too much water at times, and it washes into the Medway by another stream. When we take the water, we take any right that the miller may have to turn it off. The miller has a right to prevent it coming to the spot where our works are proposed to be. I have considered the question of compensation to the miller. It is not a large mill power.

Re-examined by Mr. JOHNSON: I have stated that some of the streams of which Snodland is composed are as far distant as five miles from the point where we take the water. This stream is gradually formed by the accretion of these different springs. I have said that in the upper part the drainage of a narrow agricultural district would flow into the stream, but it would not be in the shape of flood water, because on each side of this stream it is absorbed by the strata. I do not find the water at all deteriorated by this drainage; it is beautiful water. There are very fine trout in it, and we generally take that to be a stream fit for human consumption. The drainage, whatever it may be, is not to be compared with the drainage into the River Medway. It is a very poor soil. The rain sinks into the ground and comes out as springs. In the case of heavy rains, some slight deterioration would take place; there would be some flood-water, but still, certainly nothing at all material, or to be compared with the case of a river. The Snodland stream is a large source of the proposed supply. I have not seen the new cut which the miller has made for turning off the water above the limits of the parliamentary plan. It is not within my knowledge. He has the control of the stream by a conduit more than a mile above, but those powers cease when we get the Act.

Lord DUNGANNON: That is a point of law which you are not competent to answer.

By Mr. HOPE SCOTT: I last saw the premises about two months ago. I only know what was the state of things when we made our surface plans. No cutting existed then; what has been done since, of course, I cannot tell. I know nothing about what may have been done—I can only go to the state of things when these plans were made. I know we took sufficient powers for our bill.

By Mr. JOHNSON: Notice must be given for the whole of the stream, to its very source. My experience is that we take the mill rights, compensating the owner for them.

Mr. *Simpson* recalled, and examined by Mr. JOHNSON.

I said that water within the range of 14° was what is called soft water. Dr. Clarke established the standard—16° as the range of soft water. It would be reduced, from such a source as this, to 4° by boiling. The origin of most springs is involved in obscurity. Although there might be some ultimate connexion between the springs that have been mentioned, the connexion is 300 or 400 yards off. As a general rule, the different streams of water in chalk are not connected I said there were tracts of sand between Tunbridge and Maidstone. I think engineers generally are coming to look upon spring water as the best, if obtainable in sufficient quantity. We have very nice water at Folkestone, which we get from green sand. We might, as we advance and get greater experience, get more courage, and attempt larger towns; but it is rather a formidable thing. We have wells in the red sand producing a great deal after we have opened out immense adits, and we had some wells in chalk. It is a very difficult thing to reckon upon getting 1,000,000 gallons a day out of a well. Where there was a dense population, and a river flowing near, I should have recourse to that; but if not, I should prefer springs.

By the CHAIRMAN: I am satisfied with the gaugings taken by Mr. Gibbs. He has a very careful assistant. I have been in the habit of making estimates for the last forty years. I have generally found them correct, except where there have been alterations in the works. I think the present estimate is correct I have been through the items for compensation.

By Lord DUNGANNON: I have known the Medway many years. I consider it very difficult to purify, because it contains that which is extremely difficult to separate. It was the impression against the Cam water that made me prefer the springs. At times, the water was as clear as possible. I am satisfied that the Medway could not be made to supply Maidstone, Rochester, and other places with good water upon such a large scale, fit for domestic purposes. I speak from many years' experience.

By Mr. HOPE SCOTT: These gaugings were taken last autumn, before November.

Dr. *Letheby*, examined by Mr. JOHNSON.

I am a professor of chemistry, and medical officer of the City of London. I am well acquainted with the water supply of large towns, and have been engaged largely in analyzing water for corporate bodies and town councils, and other bodies throughout England, for the purpose of water-works. It is part of my professional occupation. I have examined the springs proposed to be taken at Aylesford, with Mr. Prestwich, who is distinguished for his knowledge and ability in such matters. I examined other kinds of water from springs, namely, the Cussington spring, the Tottington spring, and Springhead. I have examined them on two occasions. On the first occasion, in the month of December, 1858; and on the second occasion, on the 26th of March, 1859. The analytical tests did not differ materially in either case. The springs come from precisely the same strata. In the first place, I may say they were perfectly pellucid and clear, and unobjectionable in regard to appearance and colour and taste. In the next place, I found that they varied in hardness from 14° to 15½°.

By Mr. HOPE SCOTT: The Cussington spring was 14° of hardness, and after boiling ten minutes it was reduced to 5°. The Tottington spring——

The CHAIRMAN: You may leave that out.

Witness: Springhead was 15½° of hardness, that by boiling became reduced to 5 or 5½°. The total quantity of saline matter in the Cussington spring was 18·84 grains per gallon of which 12½ were carbonate of lime, and only 1·4 sulphate of lime, which gives a permanent hardness to the water. It is very nearly like the London water, with this exception, that it contains perhaps about three grains less of carbonate of lime, but otherwise it is very like the London water in its general character. It is all bright clear water, and speaking generally it is quite such as is fit for domestic use. I made a number of experiments to see if it would become contaminated with lead by storing it in leaden cisterns, or running through pipes, and I found there was no action upon lead in that way. Springhead is of the greatest degree of hardness. Snodland is nearly 18°; that by boiling ten minutes became 9° of hardness. Hoborough was 16½, and after boiling ten minutes 5½. The water coming from the different streams, meeting in the same reservoir, would become of an average degree of hardness. The Snodland stream when I examined it, was I think turbid from the presence of a little clay, that had been washed in by the rains immediately before—the rain having been unusually heavy. With that exception, it is in my opinion an effectual source of supply.

By Mr. HOPE SCOTT: I did not examine Snodland and Hoborough at the same time with the others; I examined them this morning. There was a flood there on Saturday. I did not visit the locality; the water was brought to me. The person who furnished me with it took it from the spring yesterday. It was turbid this morning; that is attributable to clay. I know the neighbourhood very well. Rain falling into a stream would soften it only in some conditions. The rain-water comes down quite soft but I have examined the streams that flow into the Thames, and I do not find them reduced in hardness by the rain; therefore, I would say this, that although it may be so in theory, it is not so in fact. It might even make it harder; for we find it the case in many water-works that the water becomes harder by the rain. I have not had time to make an analysis of Snodland, having only examined it this morning, There may be sulphate of lime: I do not know. Boiling reduces it to nine degrees, which would indicate a great deal of sulphate of lime. The hardness is increased by sulphate and decreased by boiling. The carbonate goes off in boiling. Where there is a large proportion of carbonate, boiling produces a large deposit in the vessels. That is found in manufactories in boilers to be a great inconvenience. I do not know that there is much inconvenience in water containing only from 12 to 13 grains of carbonate of lime per gallon. If it goes up to 20, then there is. The carbonate would be deposited in larger quantities by longer boiling. I have had a great deal to do with sanitary arrangements. There is not great inconvenience in common kitchen ranges from the deposit when there is no more than 12 or 13 grains. We do not hear of any great inconvenience in the metropolis from the deposits. River supplies are very nearly alike in hardness. The average is about 14 or 15 degrees. I did not take part in the controversy some time ago, about that supply. It is within my knowledge that it was considered undesirable, but I do not think the objection was entertained by those who were really raising it, and were practically acquainted with its properties. Some of the softest water is brought from Loch Katrine to Glasgow. That is considered an achievement, going that distance. There is so large a quantity of organic matter dissolved in the soft water at Liverpool that the inhabitants are taking objection to it. It has been the wish of the towns in Scotland and the north of England, to get other water supplied in places where the water is soft. I think, unless we alter the mode of getting it, there will not be safety in using it. One danger arises from the use of lead pipes. By not using lead, that would be obviated. There is another danger. Soft water dissolves organic matter, and that organic matter is held a long time in solution, and is likely to be dangerous to the consumers of the water. The condition of softness, which introduces the danger of dissolving the lead, is, to the best of my memory, when it contains six or seven grains of carbonate of lime in the gallon, and from one grain to one and a quarter of sulphate of lime. I think there would not be danger, if there were six grains of carbonate and one or two of sulphate of lime, from lead pipes. I could scarcely discern an object the other side of the bottle containing the water sent to me for examination.

By Mr. HOPE SCOTT: From Dr. Miller's analysis of the water at Farleigh Bridge I should say it is good water; it would be perfectly safe as regards lead pipes. I should consider it good water chemically. I remember last year making examinations of that part; but I cannot remember the particulars of the analysis. The impression on my mind was that the Medway was turbid, with a great deal of organic matter in it. It was taken at the time that I was visiting the district. I was examining the whole of the water, and I really cannot call to mind precisely the result.

By Mr. JOHNSON: I examined the Medway water for the purpose of determining whether it would be a good water for the supply of Maidstone. My conclusion was, that I could not recommend it.

Mr. JOHNSON: That, my lords, I have the satisfaction to say is our case. We have the witness who took the samples, but there was no question raised about them.

Mr. T CHAMBERS addressed the committee upon the Maidstone bill. It was quite unnecessary for him to say a single word about the necessity of procuring a supply of water for Maidstone; his case, therefore, might be limited to those points which he hoped to establish—that the Maidstone Water Company proposed and were able, if their lordships should give their sanction, to furnish an adequate supply of water to the town of Maidstone at a cheap rate and speedily; and that, as contrasted with the two companies whose schemes had been before their lordships, the scheme he represented was the appropriate scheme, and the others were unnecessarily large and unnecessarily costly, and would take probably a very considerable time before they could be carried out. Their lordships had had the proposal to supply Maidstone by two companies, which proposed at the same time to supply the towns of Rochester, and Chatham, and Strood; and if their lordships were acquainted, as probably they were, with the line of country between those places, it must strike them at once as singular that it should be proposed to set up a company which should supply both those towns, Maidstone and Rochester, there being between them a very high range of country and very steep hills, and therefore of necessity involving expensive works. As distinguished, therefore, from those propositions, the Maidstone Water Company proposed to supply the town of Maidstone, and the town of Maidstone only. With reference to another bill which was to come before their lordships, he might remind them that if they should sanction the Maidstone bill, they would find that natural provision was made about 16 miles distant for an ample supply to the other town, and that those towns might be supplied, not by a special scheme to be set on foot, but by an actual company in possession of the ground under a commission for the supply of that part of the country already. That would leave Maidstone to provide for itself. He would now call their lordships' attention to what was proposed to be done for the supply of Maidstone. The water from the Medway it was utterly impossible to use for that purpose. A good deal of evidence had been given, and some in favour of its adoption; but he thought their lordships would be of opinion that it would not be the best source of supply. There could be no doubt that whatever it might be brought to by more or less expensive processes, the people of Maidstone had set themselves against it with the most positive hostility. They were determined not to have it, if they could get any other, and that was a determination they had persisted in for many years. Mr. Plumly said at times it was very dirty, and that there were two kinds of animalculæ in it, one of which was not found in any other water. What the effect of that might be they could not tell. Mr. Spencer said there was clay and chalk in the water, which he thought difficult to remove by filteration. Mr. Gibbs said that there was besides a great quantity of sedgy matter, and that it never would be bright, for no filter would remove the discolouration from the peculiar mixture of clay and chalk. Then, Mr. Simpson, who had a very large experience of this river, and others said it never could be made bright, and he would rather not drink it. Therefore, the Maidstone people had some reason in resisting, at any risk, the introduction of it. They had many years' experience of every variety of badness in water, and yet they said "Don't put a stop to this bad system by introducing another." Now the next argument against the Maidstone, Rochester, and Chatham scheme was this, that

it involved a very large expense. A capital of £85,000 was needed, and, so far as Maidstone was concerned, that was a capital raised for the supply of that town. They began with a level of upwards of 300 feet, requiring 150-horse power to their engines, and of course an outlay in proportion; and then, having got their water to a height of 320 feet, they took it seven miles in a direct line before they brought it within reach of any customer. The promoters of the Maidstone bill said that this was utterly unnecessary. It was all out of the way; there was no natural communication between Maidstone and Rochester. Maidstone could be supplied directly, without having a main seven miles in length, very costly; and, on the showing of their own engineer, liable during the first few months, at all events, to be breaking at different points, until all the weak points had been detected and the bad pipes supplied with good ones, and, therefore, subject not only to expense, but to risks which an engineer could understand better than he could explain. The question was, is such an expense at all necessary? Then, with regard to the other scheme, the spring-water scheme, the Medway Valley as it was called, though it was not liable to the same objections altogether, it was liable to the same objections on the ground of expense. It was not liable to the same objection on the ground of the quality of the water, but it was liable to some objections of its own. The scheme which he had the honour of submitting to their lordships was one so simple, and constructed within such narrow limits, that they had no difficulty about land, and there was no dispute about compensation; whereas the scheme which had last had the attention of their lordships, ran through a large extent of country, and came into contact with mill-owners and farmers in every direction, with not one of whom had an agreement been made for the purchase of the property or compensation for their works. He would draw their lordships' attention to the fact, that the Snodland spring was to furnish one-half of the whole quantity that the Medway Company hoped to get. The compensation for the use of that spring must be large. Mr. Betts, out of great regard for the town of Maidstone, offered to allow them the use of those springs at £600 a year, or at such other sum, not less than £300 a year, as arbitrators might appoint. There was uncertainty as to the amount. £4500 only was allowed in the estimate for compensation; but he (Mr. T. Chambers) asked their lordships whether £4500, or three times that amount, could be named for that purpose. With regard to Tottington, so much objection had been raised by present occupiers of the stream that it had been struck out of the scheme and given up. There were contingencies in that scheme which it was unnecessary to bear. It had nothing properly to do with Maidstone, but rather with Rochester, Chatham, and Strood. The Maidstone Company said that those towns could find water for themselves; therefore, whether the risks were smaller or greater than he had represented, they were risks which were unnecessary; and their lordships were now asked to say that the smaller scheme, which was perfectly adequate, was the best, because it was done at the least cost and with fewest contingencies. There was another difficulty, the case of the mill-owner, a gentleman who had a mill with a 14 years' lease upon one of those streams which they proposed to divert. He would remind their lordships of the result of the cross-examination of Mr. Gibbs upon that very subject, whether in point of fact the parliamentary powers which that company proposed to obtained would protect them against that mill-owner. The parliamentary powers would expose them to the whole pressure which that miller might bring to bear upon them for compensation, but would they be protected against what he might do even then. He did not say that they would not, but it was a contingency which was perfectly unnecessary to be incurred for the purpose of supplying Maidstone with water. There was another mill upon the stream—another miller to be compensated. Besides that, the pipe had to be passed through a farm which belonged to a petitioner whom he (the learned serjeant) also represented. He held a large farm, which consisted of chalk. Their lordships were aware of the Portland cement trade, which had increased in this country to a great extent, and was virtually in the hands of the persons in that part of England. The mud which these gentlemen were going to take out of the river—the mud of the river Medway combined with that species of chalk found there—made the best Portland cement; and the farm which the petitioner held had, within the last forty years, increased in value—he could scarcely expect their lordships to credit it—3000 per cent! Every single cubic inch of the property which he held there, by mixing with the mud of the Medway could be made into Portland cement. These pipes passing through would be a great loss to him. Of course that would be a question of compensation; but it was a question of money, and the consumers of the water would have to pay in proportion. A gentleman who had just been examined before their lordships had said that he had a phial of the Snodland water, taken from the spot where these gentlemen were going to take their water, and it was so dirty and muddy that he could not discern an object on the other side. Yet this was to be delivered without filtration! He submitted, therefore, that it had some of the disadvantages of the river water. It was a rivulet that ran for miles. What drainage it received nobody could tell; but at all events it was hardly entitled, when it had travelled five miles, to be called spring water. There was a paper-mill upon it, making straw paper, and using chemicals. The learned counsel then proceeded to detail the scheme which the Maidstone Company proposed. Close to Farleigh Bridge there was a long strip of land by the side of the Medway. It was proposed to sink there. The water would be obtained from the green sand, which Dr. Letheby had said was of an especially good character. The green sand ran for miles in every direction, and was the gathering-ground for the whole district: 20 miles he was told was the extent of this gathering ground of the water that flowed through the chalk and through the Kentish rock. They were not asking to supply 100,000 people with water, but they estimated it at 30,000. Mr. Pilbrow, who understood the district well, would tell the committee that he did not believe there was the smallest reason in the world of there being any lack of water to the extent of twice the quantity required. They reckoned upon requiring 600,000 gallons a day. With regard to the quality, he would show their lordships what that was, and he believed they would come to the conclusion that it was a bright, clear, good water. They proposed to raise the capital in 2000 shares at £10 each, the borrowing powers being limited to one-fourth instead of the usual powers, which were one-third of the original capital. The works were estimated at £17,000, and contingent expenses would take up the remaining £3000. They wanted 4 acres of land.

Mr. *Benstead*, examined by Mr. T. Chambers.

I am a native of Maidstone, and have made myself acquainted with the soil of the district. I was appointed one of the Pavement Commissioners at Maidstone for the investigation of this and other questions. This question has excited attention very much indeed for years. I have examined the plans made by Mr. Pilbrow. I know where he proposes to make his works. There is a constant supply of water: it runs into a natural reservoir. In my judgment, it is well adapted for the supply of Maidstone.

Cross-examined by Mr. Hope Scott: I have had no means of gauging the supply. There are fissures in the red stone through which the water escapes. I have not calculated the extent over which the rain must fall to supply the reservoir. Other persons have done so. The scheme of the Maidstone Company has been brought before the Pavement Commissioners.

Mr. *James Pilbrow*, examined by Mr. T. Chambers.

I am a civil engineer, and have been in practice many years, and I have had great experience in the supply of towns and districts with water. I know Maidstone very well indeed. I was called upon to investigate, some time ago, the different schemes on foot for supplying Maidstone with water. That was about five years ago. I selected that which I thought desirable; it was that which is now under the consideration of their lordships. The rock is full of fissures, and the water cannot get away there except by finding its way to the river through the sand, and the river being there holds up the water in the sand, so that while the river has water in it the sand has also water. It is water which would pass into the river. It is preferable to the river-water, being of the same quality without the impurity which the river gets. That is the source of supply. We require three or four acres of ground. I estimate the cost of the pipes at £7373 10s., taking them at £6. 15s. a ton; the cost of sluice-cocks and hydrants, £365; the wells, culverts, and headings, £1250; for engines and pumps, £4200, or £60 per horse-power; for engine and boiler houses, £1500; and for the compensating reservoir at the top of the hill, about £1500; making a total of £17,018 10s. That is, in my judgment, a full estimate. We reckon upon supplying 30,000 persons, there now being about 24,000 or 25,000 in Maidstone, at 20 gallons per diem each person. That would be 600,000 gallons a day. I am satisfied that my works would gather ten times as much as that.

Cross-examined by Mr. Hope Scott: I went before the committee on standing orders. I do not remember that that committee raised an objection to our taking the river-water, and limited us to such a level that we could not touch it. I remember nothing of that kind: 13 feet was marked upon my section as the level. I made experiments, but there was such a rush of water that I could not get on without a steam-engine.

By Mr. Baxter: When I sunk a well, I used a hand-pump; it brought up sand with the water. We pump very hard in making a well, in order to open out the stratification. The consumption in London is about 30 gallons per day for each person, but there is great waste. London is no criterion for any country town.

By Mr. T. Chambers: I have no doubt that 20 gallons is a safe estimate. The supply is continuous in London.

By Lord Dungannon: I am not fond of having recourse to river-water for supply.

Mr. *Beardmore*, examined by Mr. T. Chambers.

I am a civil engineer, connected with the river Lee, and am very familiar with hydraulic works. I know the proposed works of the Maidstone Company. I think there is no doubt about the adequacy of the supply. I have examined the estimates, and I think they are adequate to cover the works.

By Mr. Hope Scott: I have paid a great deal of attention to gauging. The rock is not represented rightly in the plan—it slopes the wrong way. There is about 40 feet fall in a mile and a half. It is not necessary that the water should have that descent.

By Mr. T. Chambers: Mr. Pilbrow said, and it is the fact, that the water flowed so fast that he could not continue his operations, so that there is no law by which it is necessary that the water should have a fall of 40 feet a mile to descend there. It flows freely.

Friday, March 9.

Mr. *Richard Downes*, examined by Mr. Hope Scott.

I have taken water from the meadow in which it is proposed to construct the water-works. I took it last evening, and I produce a sample. The spot was about the distance of this room from the Medway. It was dark, so that I could not see the colour of the water in the Medway; and, as it was, I was obliged to have a lantern. I took another sample from a well belonging to Mr. Sampson, on a piece of rising ground, about fifty yards from the other place. The first sample was taken from the surface. I have given the samples to Mr. Dugald Campbell.

Cross-examined by Mr. Venables: I do not live at Maidstone, but went down on purpose to take the samples. The ground is rough, consisting of hollows and hillocks, and I took the sample from one of the pools, into which the water seemed to trickle from the high ground behind, where Mr. Sampson's well is. The well is about 20 feet deep.

Re-examined by Mr. Hope Scott: I cannot distinguish by the eye any difference between the quality of the two samples. The difference of elevation between the pool and the well is about the depth of the well itself; so that the water in both cases would be upon about the same level.

By the Committee: The bottom of the pool was sedgy—in short, like a marsh. In walking up to it, I had to pass through wet ground. It was very wet ground altogether. There were about 5 or 6 inches of water in the pool.

Mr. *Dugald Campbell*, examined by Mr. Hope Scott.

I am a chemist, living in London. I have turned my attention to the analysis of water. The last witness gave me three specimens, marked Nos. 1, 2, 3. No. 1 was also marked, "Sampson's well, 16 or 20 feet deep." [Sample produced.]

Mr. Downes said, sample No. 3 was taken from a spring in the garden belonging to the railway station, on the opposite side of the road. No. 2 was taken from the meadow.

By Serjeant Wrangham: The garden is rather higher than the meadow, but not so high as the top of the well.

Mr. *Campbell's* examination resumed: I have not been able to analyze the samples. I have made a preliminary examination, by means of the soap test, of samples Nos. 1 and 2. No. 1 (the well water) is about an average chalk water, containing 19° of hardness. It is pure in colour and tasteless. No. 2 I found to be considerably harder than the well water, containing about 35° of hardness. The difference arises from the surface impurities in the latter.

By the Committee: I suppose no person has had more experience in examining waters than myself. I have examined waters belonging to all countries.

By Serjeant Wrangham: I have had no time to test No. 3, but it has all the appearance of No. 1.

By Mr. Venables: It would take some time to analyze water properly; I should prefer to have three days, but still I could make an analysis for the purpose of forming an opinion in twenty-four hours. I like to have a gallon to operate upon. I can ascertain the hardness by the soap test, but not the constituent properties. For every 100 gallons of water, of 1° of hardness, you require two ounces of soap to render the water as soft as distilled water. I was six weeks employed in making experiments on the Lock Katrine water: the hardness of that water does not exceed 1°; sometimes it is rather more than half a degree, and sometimes less. That is ex-

tremely pure water. I think it a desirable source of supply, and much to be preferred to water of 15° of hardness.

By the COMMITTEE: No. 2 is 35° of hardness; and that hardness arises, I think, from surface impurities I am of opinion that water of that quality is not desirable for drinking purposes. Hard water, however, is preferred by many. The water of Lincoln's Inn contains 104 grains of solid matter, 60° of hardness, and 25 grains of lime from decomposition.

Re-examined by Mr. HOPE SCOTT: I prefer soft water for the supply of towns. I was called in to go and examine the Loch Katrine water, after there had been a strong attack upon the water as being too soft. There was no choice for Glasgow, but to go to one of the Highland lochs, in consequence of the impurity of the Clyde water. Water of 19° of hardness, taken from sample No. 1, can be reduced to 3½° by boiling a certain time. If a well were sunk in the meadow, where No. 2 was taken, I should expect to find a better water even than in the well, because I believe the well water is deteriorated by surface impurities.

By the COMMITTEE: For drinking purposes, hard water is more refreshing to the taste than soft water. I know nothing about the component parts of the sample No. 2; it may contain many surface impurities. My test only applies to the hardness.

Lord LONDONDERRY: We have no evidence as to the goodness of the water, only as to the hardness. I do not think we can come to any decision, because we do not know what the water is composed of.

The CHAIRMAN: It is very hard for us to decide for the Maidstone people that they shall drink this water, unless we know what it is composed of.

Mr. HOPE SCOTT said the inquiry could not be concluded today; therefore, perhaps, the Committee would allow Mr. Campbell to make an analysis, and be prepared with his report on Monday.

Lord LONDONDERRY thought it most important that the committee should have evidence as to the component parts of the water, before they were called upon to decide.

wIt was then arranged that Mr. Campbell should make an analysis at once, and report the result on Monday.

Mr. *Beardmore* was re-called, and asked if he knew anything of the arrangement with the Commissioners of the Medway Navigation. He was unable, he said, to give any information upon the subject.

Mr. HOPE SCOTT then called the following evidence against the Medway Valley scheme.

Mr. *Joseph Peters*: I appear for my father, the petitioner, against this bill. My father holds considerable property in the neighbourhood, and also some extensive lime works at Woldham. The proposed scheme would intervene between the river side and our beds of limestone, and the damage to our property, should the proposed works be carried out, would be very serious. There are fifty acres of greystone there, which we value at £3000. per acre; it is valuable for making freestone cement, and I have only estimated its value at 6d. a ton. The scheme would cut off our access to the river.

Cross-examined by Mr. JOHNSON: The greystone is worth 6d. a ton before working. We are at some expense in our opposition to the bill.

By Mr. HOPE SCOTT: We oppose the bill because the pipes will greatly interfere with our property. We are the holders of the most valuable mineral property on the Medway. We estimate its value at £200,000. It will, hereafter, be the principal source for the supply of Portland cement. We, therefore, pray your lordships not to pass this bill.

By the COMMITTEE: The pipes will be in the way of our excavations, by cutting off the communication between them. It is impossible to estimate the amount of damage. The property has increased 3000 per cent. since my father commenced lime-works on the Medway. The compensation we should require would be very great.

Mr. BAXTER asked if the objection would be met by rendering the pipes moveable, and altering the level from time to time, according to the varying level of the excavations?

Witness said that would in a great measure meet the difficulty.

Mr. BAXTER said he was assured by the engineer that the thing could be easily accomplished, so as to avoid interfering with the communication between the excavations.

Lord LYVEDEN said it was a matter for arbitration.

Mr. *Waggar*, examined by Mr. HOPE SCOTT.

I am the overseer of Aylesford. There is considerable feeling in the parish against the Tottington spring being interfered with. The company propose to abandon interfering with that spring; but we are not satisfied with the abandonment unless the Cussington spring is also abandoned. The neighbourhood is dependent upon the Tottington spring for its supply of water. Last summer there were 16 wells dry. The parish in vestry assembled had presented a petition against the bill, for they feel that the spring is of paramount importance to them. They were put to considerable expense in opposing the bill last year, and they think it very hard that they should have to come up and oppose it again. I know the Snodland brook stream. It is a fluctuating stream, subject to floods, and cannot be depended upon for a constant supply. I think the water of that stream very impure; it takes its rise at Wrotham, ten miles off; there are precipitous hills by the side of the stream, and when it rains the water runs down into the stream rapidly, and carries with it a great quantity of surface impurities. I would rather drink the water of the Medway at Aylesford bridge, than drink the Snodland water. I have no doubt the company would prefer to get their supply from the Cussington spring rather than from the Snodland.

By the COMMITTEE: We object to the bill, because we believe that a pumping station at Cussington spring would cut off our supply. The company does not propose to supply us with water.

Cross-examined by Mr. BAXTER: I have known the springs for twenty years. I have never sunk wells myself, nor constructed water-works; my opinion is formed upon the evidence given before the committee last year. I heard it stated yesterday in evidence that they proposed to have a pumping station and a reservoir in the neighbourhood of Cussington spring, and to carry it down, so as to tap the waters of the Springhead and the Tottington springs. I suppose it is not possible to take the water from the springs unless the well is sunk below the level. I do not know to what level it is proposed to sink the well. I have seen the plans, and suppose that if one spring is tapped it will affect the others. The stream rises rapidly in heavy falls of rain, and subsides in about twelve or fifteen hours. I say again that I would rather drink the water of the Medway than of the Snodland brook stream. A great deal of drainage from farms and villages goes into the Snodland. It is true the sewerage of Maidstone goes into the Medway, but the volume of water in the Medway is so much greater that the water is comparatively purer than that of the Snodland. Unless the river is disturbed, the water is clear, and it is customary for the bargemen to fill their water casks from the river before putting out to sea.

This was the case with reference to the Medway Valley Bill.

Mr. HOPE SCOTT then opened the case of the Brompton, Chatham, Gillingham, Rochester, and Strood Water-Works. This he said must remain the title of the bill, though it was proposed to omit Strood from the operations of the company, on account of there being already some water-works in that town. The bill was promoted by a company already in existence, and he confessed the opposition to the scheme on the part of the Medway district and the Medway Valley Companies, seemed to him to be of the most slender character possible. The engineers for those companies, in their evidence a day or two since, showed that they had very little knowledge of the Brompton Company, or of its sources of supply. The company was already supplying both the Bromptons and a part of Chatham, and they now came before Parliament to prevent the district being invaded by two speculative companies, whose sources of supply were ten miles distant. The company which he represented was formed in 1856 to supply Gillingham, Old and New Brompton, and the neighbourhood thereof. The company started with a capital of £10,000, under the Limited Liabilities Act. It was now proposed to increase the capital to £30,000 by shares, with the usual borrowing powers, and to extend the supply to Chatham and Rochester. He believed the first step in the formation of the company was taken at the instance of an officer connected with the Admiralty, with the view to supply the Government establishments at Gillingham and Brompton. The works had been carried out under the estimate, and the company had already declared a dividend of 2 per cent. Rochester and Chatham formed one long street, with Brompton; and it was well known there were many extensive Government establishments in all these. The water was obtained from the chalk at Luton, and the reservoir was situated at Star Mills, at the top of Chatham Hill, in the Canterbury Road, at a level which enabled the company to supply the whole of the district named with the greatest facility. With respect to the quality of the water, he called attention to the evidence of Mr. Spencer and Mr. Gibbs to show that water from chalk was not objectionable, if softened according to Dr. Clarke's process, as compared with a river supply. There only remained the question of the certainty of supply; and, upon this point, there could be no doubt that the company would be able to ensure an abundant supply. He was told that a very small expenditure indeed would enable them at once to obtain an unlimited quantity from the existing wells. To show the resources of the company at the present moment, the learned counsel stated that, in 1858, they only supplied 242 houses, whereas *now* they supplied 507 houses, besides three brickfields, which alone had consumed 623,000 gallons since Dec. 25, last. They were also under contract to supply the convict prison, the Huts and St. Mary's Barracks; and negotiations had been entered into to supply Fort Pitt and a portion of Chatham Dockyard. Thus, a local company had already stepped into a gap, and performed an essential service to the district and to the Government works. He submitted that a local company, already in operation, was entitled to the preference over distant and speculative companies, the more particularly as there had not been a single complaint of insufficiency against the company since their works had been opened, and they appeared before the committee with a petition largely signed by the inhabitants of the district. The only petitions against the scheme came in reality from the Medway district and the Medway Valley Companies; there was not a petition from a single landowner, lessee, or occupier. With respect to the two opposing schemes, he was instructed that they could not give a supply at a sufficient altitude to serve Chatham and the neighbourhood; on the contrary, they proposed Maidstone as the centre of their operations, and to make Chatham and Rochester a mere appendage, to be supplied by a pipe nine or ten miles in length, laid down through a country almost barren of inhabitants. He need not, he said, insist upon the inconvenience which such a scheme must entail upon the district now under consideration; nor remark upon the fallacious notion about competition which it might be alleged it was desirable to introduce; for, as had turned out to be the case with railway companies, instead of competition, the two rival companies would come to terms and divide the profits. With respect to the quality of the water supplied by the respective companies, there could be no comparison between the pure, hard, refreshing water now obtained from the chalk, and the impure water of the Medway, proposed to be taken by the district company, deteriorated as it was by the drainage of towns, hop gardens, and cement works, which rendered it of such a glutinous nature that, if a man drank it, his mouth would be closed for ever and ever; or, as he had heard, a witness say, in other water committees, it would be as good as meat and drink to him; while, in reference to the resources of the Valley Company, the Tottington and other springs would be found insufficient, and the water from the Snodland stream was so impure, that Mr. Waggar said he would rather drink the water of the Medway itself.

The following evidence was then taken;

The Rev. *Daniel Cooke*, examined by Mr. HOPE SCOTT.

I am the Incumbent of Old Brompton, in the immediate neighbourhood of Chatham and Rochester, and forming with those towns an almost continuous line of houses. I have lived there thirteen years. We formerly experienced so much inconvenience from the want of water, that in our house we have had to use the same water over and over again for washing. I was one of the first who moved in the matter of procuring a better supply. I was sent for by the superintendent of the dockyard on the subject, with the object of seeing if a better supply could not be obtained both for the town and for the dockyard. The supply was so limited that, in many houses, they have not had more than a pint per day. At my instigation, a meeting was called, and the result was the formation of the present company. I am one of the directors. It is purely a local company; there is scarcely a stranger on the list of shareholders. It was not a commercial speculation; on the contrary, the shareholders did not expect to receive any dividend. We are now furnishing a sufficient supply.

By the COMMITTEE: Sufficient for all purposes. It is the best drinking water I have tasted.

Examination continued: The inhabitants have often thanked me for the part I have taken in the matter. The supply extends to Chatham, and there are negotiations on foot for supplying several of the Government establishments. The company has paid a dividend of 2 or 2½ per cent. I have often been urged by the Chatham people to persuade the directors to extend the works to Chatham and Rochester.

Cross-examined by Mr. Serjeant WRANGHAM: The population of Old Brompton at the last census was 5030; the population of New Brompton is about 5000. The two Bromptons are separated by the fortifications. Our company supply part of Chatham, and the whole of Gillingham, which is a scattered agricultural district extending for some miles into the country. We commenced supplying water about eighteen months back. I do not know the quantity we supply daily, but I know we have more than we want.

By the COMMITTEE: The proposal of bringing water from Maidstone is unnecessary, inasmuch as there is an abundant supply close at hand. My attention has been drawn to our ability to give a more extended supply,

and I am assured that our resources are unlimited. The engineer officers at Brompton, speak of the water, for drinking purposes, in the highest terms.

By Mr. CLARKE (in the absence of Mr. Venables): In the construction of the present works, we contemplated supplying the whole of Chatham and Rochester at some future time. We bought ground, and laid down large mains with that view.

By the COMMITTEE: I have not the slightest doubt that we could furnish the whole of the district in question with an abundant supply.

Mr. *George Buchanan*, examined by Mr. HOPE SCOTT.

I am clerk to the Medway Union, which includes the whole of the district proposed to be supplied by the present company, with the exception of Strood. I live in Chatham myself. The population of Chatham, including part of Old Brompton, is 22,093; of Gillingham, including the remainder of Old Brompton, and all New Brompton, 9323; of St. Margaret's, Rochester, 6702; of St. Nicholas, Rochester, 3385; of the cathedral precincts, 188; of Lidsing, 39; of the hamlet of Grange, 165; making a grand total of 41,895. This estimate, which includes the military and navy stationed in the district, is subject to the increase which has taken place in the population since the census of 1851. I have resided in Chatham thirty-five years, and I am satisfied there is a general wish for a better supply of water. It is also the general wish of the inhabitants to extend the works of the Brompton and Gillingham Company; and I know there is a great prejudice against a supply from Maidstone, or from the Medway itself. The Brompton water is said to have a good character, and the people of Chatham wish to have it. I believe seventeen out of twenty are of that opinion. They have every confidence in the directors of the Brompton Company, who are well known to them as residents.

By the COMMITTEE: If the bill were passed, I believe all the shares would be taken up directly.

Cross-examined by Serjeant WRANGHAM: The company is not formed under a private bill; if it were, I have no doubt all the old shares would have been taken up. If you tell me that only 1435 shares are taken up out of the present 2000, I presume it is so; and I believe the reason why they are not all taken up arises from the circumstance that it is, at present, only a Limited Liability Company. For twelve months, I have been without water upon my premises, and, at the present time, I know large hotels that are obliged to send a quarter of a mile to get water for drinking purposes.

By Mr. VENABLES: The inhabitants have a prejudice against the Medway water, in consequence of the drainage that falls into it from various villages and towns, which to the Chatham taste is not very palatable. The Medway at Rochester is brackish, more salt than fresh.

Re-examined by Mr. HOPE SCOTT: The wants of Chatham are very urgent, and the company which would supply them the soonest would be favourably received.

By the COMMITTEE: I know the whole of the district, and from the success which has attended the Brompton supply hitherto, I believe they could meet all the wants of the district. I see no necessity for bringing water from Maidstone, nor do I believe such a scheme would be so satisfactory in the result.

Mr. *Meason*, examined by Mr. HOPE SCOTT.

I am deputy-governor of the convict prison at Chatham. We are supplied by the Brompton Company, and we always find the supply abundant and good. It is pleasant sparkling water.

Cross-examined by Serjeant WRANGHAM: I do not know whether the water is hard. There is no other company that could supply us.

By Mr. VENABLES: The quantity to be supplied to us is under the contract 12,000 gallons a day.

By the COMMITTEE: The water is very satisfactory as drinking water: the whole of the officers, as well as the convicts, drink it, and there has never been a complaint against it.

Mr. *James Budden*, examined by Mr. HOPE SCOTT.

I am the high constable of Chatham and a director of the Brompton Company. The people of Chatham think a better supply of water absolutely necessary, and their feeling is generally in favour of the Brompton Company. They look upon the other companies as commercial speculation.

Cross-examined by Serjeant WRANGHAM: When the Brompton Company was originally formed, the feeling on the part of the projectors was rather to supply the public than themselves; though I believe, should the scheme be carried out, it will turn out to be a good commercial speculation. Of course, any company started as a commercial speculation, would feel it their interest to give the best supply they could.

By Mr. VENABLES: Our present supply takes in an area of four miles, and a population of about 12,000. We could easily supply a larger district if we had the necessary legal powers to raise capital and extend our works. We have year after year talked of extending our operations. It was a few months since that we determined to apply for the present bill. I am not aware that the bill would not give us powers to extend our works.

Re-examined by Mr. HOPE SCOTT: We have always had it in contemplation to come to Parliament for more extended powers.

By the COMMITTEE: I believe we should be able to supply the whole of the district in question within six months from the present time; and I have not the slightest doubt that we shall be able to maintain an abundant supply at all times. There is no necessity to bring the water a distance of nine miles; and, moreover, it would take a much longer time to bring that scheme into operation than ours.

Mr. *James Andrews*, examined by Mr. HOPE SCOTT.

I am a surveyor and architect, residing at Rochester. I have suffered seriously at times from the want of water. The feeling of the town is decidedly that it is in want of water, and as decidedly in favour of an extension of the Brompton works. The inhabitants would not like the Medway water. I have been in the habit of drinking the Brompton water daily. It is a nice sharp water, and very popular. Indeed, I am building several houses at Brompton, and I have abandoned the old plan of digging wells, and have arranged, instead, for a supply from the company's pipes.

Cross-examined by Serjeant WRANGHAM: I have no doubt a supply could be obtained, more than double the quantity required by the whole district. The proposed Act would not allow them to take any more land; they have sufficient as it is for the purpose of extending their wells and enlarging their reservoir.

By Mr. VENABLES: My objection to a reservoir at Maidstone, arises from the greater risk of accident to such a length of main, and also to the quality of the water itself. I prefer the chalk water to the Medway water.

Mr. *George Boulton*, examined by Mr. HOPE SCOTT.

I am the secretary to the Brompton Company. It was formed, in consequence of the want of water in the neighbourhood, under the Limited Liability Act. Of the £10,000 capital, £7580 have been paid up on 1540 shares, with a forfeiture on some other shares. There are 106 shareholders, all of them either residents or friends of residents. All the contracts have been paid. The company owe debts to the amount required for completing the works above the shares paid up, but the capital uncalled is more than equal to those liabilities. We now supply 580 houses, three brick-fields, a military wash-house, the convict prison, the barracks, huts, and garrison hospital. Our contracts with these government establishments extend over three years, with power to the Secretary of State to continue the contract for an indefinite period. We have also an arrangement with the authorities to supply water in case of fire in the dockyards, and are in negotiation for supplying Fort Pitt. We have, moreover, provided our existing mains with seventy hydrants in case of fire. It would be impossible to give any statement of the quantity supplied daily to the various government establishments, as their consumption is irregular; but we have never had a complaint of an insufficient supply. Our rates to the smaller class of houses are 6¼ per cent., with a deduction of 10 per cent. for groups, and so on varying to 5 per cent. on large houses. We took the charges of other companies as the basis of our rates, and I find, compared with large towns, that they are about the average. If the bill should pass, I believe we should have no difficulty in supply the whole district. With respect to the additional capital, I will not undertake to say that we should have no difficulty in raising it, because the Chatham people are rather slow to part with their money; but I have no doubt that we should be able eventually to raise it. The principal inhabitants of Rochester are in favour of the bill, as shown by their contributing to the share list.

Cross-examined by Serjeant WRANGHAM: I am not aware that the bill will not give us power to extend our works beyond the powers we already possess. Our area of supply at present contains 1553 houses, and out of this number about 500 take water from us. I believe one reason why more houses do not take water is, because many of them get supplied by their neighbours. Again, it is a very poor district; and moreover, as many of the houses are already furnished with wells, the landlords will not incur the expense of laying on a supply from the company's mains. The main to the reservoir at the top of Chatham Hill is 12 inches, and from that point there is a main of 8 inches down to Brompton, and another main of 9 inches carried down to Chatham. In addition to this, arrangements are made for another main from the works at Luton in another direction to Chatham, so as to provide against any stoppage of the supply. I do not know the exact quantity we pump daily; but I should say it amounts to 40,000 gallons. I imagine we supply about 3000 people, which will give about 13 gallons per head.

By Mr. CALVERT: Our present reservoir holds 200,000 gallons.

Re-examined by Mr. HOPE SCOTT: After being eighteen months in existence, we supply about one-third of the houses in the district, and I think that in this we have done much better than we expected. We have never had occasion to shut off the supply, and to procure this we have not more than twenty or twenty-two hours' pumping a week.

The committee adjourned till Monday.

Miscellaneous News.

COUNTY AND GENERAL GAS CONSUMERS' COMPANY (LIMITED.)

The Third Ordinary Annual Meeting of this Company was held at the Offices, King William Street, City, on Tuesday, the 23rd ult.—E. H. J. CRAUFURD, Esq., M.P., in the chair.

The minutes of the last meeting having been read,

The SECRETARY (Mr. Parker) presented the following report from the directors, and the accounts for the half year ending the 31st of December, 1859:—

The directors beg to submit the balance-sheet and accounts for the half year ending Dec. 31, 1859.

The expenditure on capital account shows an increase of £2712. 2s. 11d. during the half year, which has been incurred in making considerable additions to the company's mains and services, and in improvements on the several works. The mains in the Walton district have been now carried into the town of Weybridge.

Notwithstanding that these extensions have been only recently completed, the results of the working account show already an improvement in the profits of about £200 on this half year, being an increase of more than 40 per cent. on the previous half year.

In stating the value of the several works as entered in the balance-sheet, due allowance has been made for wear and tear.

The number of shares on the register at Dec. 31, 1859, was 1632, showing an increase of 452 during the half year. All shares were fully called up on the 9th of November last. An option, however, has been given to recent allottees to discharge the balance beyond the first deposit by instalments of £1 each, at intervals of not less than three months, as the directors may require. Under this option, there have been allotted 145 shares, on which no payment has yet been required beyond the first deposit. The remaining 1487 were fully paid up before the 31st of December, with the exception of a trifling arrear of £5, which has since been discharged.

The directors have much pleasure in announcing that they have entered into a contract for the purchase of the gas-works at Ware, in Hertfordshire, yielding a gas rental of upwards of £1000. The company, under this contract, will enter into possession on the 31st of March next.

After providing for the Midsummer dividends—for all office, agency, and trading expenses—and for interest on loans (including a sum of £112. 14s. 3d., for agencies and interest properly belonging to the previous half year, but not brought to charge until the close of the year) a net profit has been realized of £159. 11s. 7d.

Out of this sum the directors recommend the declaration of a dividend for the half year ending Dec. 31, 1859, at the rate of 5 per cent per annum, on all shares registered prior to that date, to be made payable on and after the 31st of March, next. The sum required for this purpose will be £144. 6s. 10d.

The following members of the board—viz., Erasmus Wilson, Esq., and R. M. Christie, Esq., retire from office by rotation, but being eligible beg to offer themselves to the shareholders for re-election,

Messrs. Camroux and Thomas, the auditors, having completed the term for which they were appointed, beg likewise to offer themselves for re-appointment.

The CHAIRMAN moved the adoption of the report, and in doing so observed that he thought the board might look with confidence for the approval of the shareholders in reference to the progress of business since their last meeting. Although slowly, they were moving in the right direction, and therefore there was every reason to be gratified with the result. At the last meeting a suggestion was made, that it would be well to have a little more detail in the accounts and balance-sheet; the directors had acted on that suggestion, and had given in the general working account the amount of gas rental for the two quarters to Christmas in separate items. The comparison between the two showed that the rental for the Christmas quarter was over three times the amount of that for the Michaelmas quarter. In ordinary circumstances, it was about double, and it might therefore be taken as an indication that the business was steadily increasing. There was one point in the accounts which might strike attention, viz., that there was no item for wear and tear. Hitherto the directors had been carrying all the profit received in the way of meter-rent, sales of meters and services, &c., to the credit of the

capital account; so that, practically, a full amount of wear and tear was written off, though it did not appear in the balance-sheet. They were, however, about to introduce an altered system of keeping the books, by which the sundry items of profit to which he had referred, and others which were now lost in the capital, would be brought out and shown in the accounts, and then an item for wear and tear would be introduced. It would be observed that, in the general working account, the directors had separated everything which ought to be carried to account of profit and loss. For instance, some of their works being leasehold, there was a rent to pay upon them, while upon the freeholds there was no corresponding charge. The accounts had hitherto been kept so as to show the rent paid, and that system would be very well if they had only one work; but, in a company like this, where there was a varied state of things, it was desirable to keep the items in the accounts homogeneous; and if they charged rent at one place and not at another, a fair comparison of the relative value of the works could not be obtained. The directors had, therefore, charged to general working account the coals, lime, wages, labour, and miscellaneous and petty expenses, while the rent and rates, which were to be regarded in the light of interest upon money, were carried to the debit of profit and loss. The increase in the capital account was satisfactory; and, with regard to one item, "Preliminary expenses," which had remained a constant amount, and was included among the assets of the company, he might observe that it was to be regarded as a debt due from revenue to capital, and to be paid out of revenue as soon as they were able to meet it. The better way, however, to consider it was, that it was nothing less, in fact, than the good-will of the works which had been purchased; and, as that was always treated as an asset, the directors had carried the £738 to the credit of capital. It would be seen that the company had now a rental and income from products of over £4000 a year, which, he anticipated, would be considerably increased by the time the proprietors met again. The extensions which had been made, and the extra services supplied, warranted this expectation, and also the belief that there was yet a wide field for the future operations of the company beyond that upon which they had already entered.

Mr. PAINE seconded the motion, which was at once adopted.

The retiring directors, Messrs. Wilson and Christie, were severally re-elected.

The CHAIRMAN stated that a wish had been expressed that the directors should possess a higher qualification, and, in deference to that wish, the directors had each increased the number of shares held by them to 100.

The retiring auditors were re-elected, after some conversation upon a notice of motion given by Mr. Clarke, that the future auditors of the company should be elected from the shareholders.

On the motion of the CHAIRMAN, a dividend at the rate of 5 per cent. per annum was declared for the half year ending Christmas last.

The CHAIRMAN also moved a vote of thanks to the officers of the company, for their zealous exertions to promote the interests of the proprietors.

The motion was cordially adopted, and appropriately acknowledged by the Secretary.

The proceedings terminated with the usual acknowledgment to the chairman and directors for their services.

UNITED GENERAL GAS COMPANY.

The Half-Yearly Meeting of this Company was held on Tuesday, the 6th instant, at the Offices, No. 6, Austin Friars—JOHN OLIVER HANSON, Esq., in the chair.

The proceedings having been opened by the reading of the notice convening the meeting,

The SECRETARY read the half-yearly report and statement of accounts, of which the following is an abstract:—

This half-yearly general meeting has been convened in compliance with the provisions of the company's charter, and in laying before the proprietors a report of the last half-year's operations, it will be seen that the profits amount to £6906, being £900 better than the corresponding period of 1858, and £817 more than the profits of the half-year ending June last.

This improvement is mainly attributable to the termination of the struggle at Cork, for although the Dublin revenue, both from gas and products has steadily advanced since the reduction of price last year, yet the general cost of coals and working, exhibits an increased expenditure, neutralizing the improvement to a considerable extent.

The proprietors are probably aware that a fire occurred at the works last December, which it was feared would have been attended with considerable expense, but we are happy to say that, owing to the strenuous efforts of our staff at Dublin, and the timely assistance of the military, fire-brigade and others, the flames were expeditiously got under, and the expense of reinstating the damage will be comparatively moderate. We are happy to add that the supply of gas to the city was not impeded in any way.

In consequence of the increasing demand for gas at Dublin, both in districts already supplied and others rapidly springing up, it will be necessary to erect a new tank and gasholder during the next season. This important addition, together with an extension of trunk mains, will be commenced with as little delay as possible.

Since our last meeting, we have the pleasure to announce to you the completion of the deeds connected with the Cork sale; the receipt of the first fixed instalment, and the final settlement of the payments by the Cork Consumers' Company, secured on mortgage to this company, until the whole of the money is paid off.

At Limerick, we have derived considerable benefits from the recent extensions and improvements of the works and district mains: but we find it impossible to keep pace with the increasing demands for gas without some addition to the gasholder capacity. With this view, we have lately taken a piece of ground adjoining the works: where we contemplate erecting a 60 feet gasholder this summer, together with a few minor improvements involving an outlay not exceeding £2000, and which will yield an increased storage of 63,000 cubic feet.

We have the pleasure to recommend the proprietors to declare a dividend of 15s. per share, free of income-tax, out of the profits of the company, and the surplus to be carried to the stations contingency account as heretofore.

We regret to inform you that, since the last meeting, we have sustained a loss in the death of Mr. Isaac Nicholson, our respected colleague, who occupied a seat at this board since the formation of the company.

Mr. Henry Wood has given the necessary notice of his intention to offer himself as a candidate on this occasion, and a special meeting, already duly announced, will be held immediately after the present one, to fill up the vacancy.

The CHAIRMAN then addressed the proprietors upon the report. He said that he was very happy on all occasions to meet the proprietors, and more especially so when the directors were able to report favourably of the progress of the company, as the accounts just read to them would show that their profits were £6906, being an increase of £900 on the corresponding period of 1858, and which enabled them to recommend a dividend of 15s. per share, being 1s. 6d. more than the previous dividend. He went on to say that the stated at the last meeting that the Cork sale would turn out between £2000 and £3000 more than was at first anticipated. He was happy to say that that expectation had been fully borne out, the actual account to be received being £27,783—capital and interest £8651. 12s. 2d., being £1783 capital, and £551. 12s. 2d. interest, more than was before stated. The directors proposed to keep the capital account distinct and separate from the amount to be received for interest, and the directors intended to divide the interest into ten equal parts, which would give every year an annual interest of £864, being £432 half yearly, which sum is placed to credit of profit and loss account, and present half-year's account. As to the trade expenses of the year, the principal features were the increased cost of coals; the excess at Dublin being 9½ per ton, and at Limerick 1s.11d. per ton; the coals at Dublin were £1911 more than the corresponding period 1858, the 9½ accounting for this; on the other side of the account, the reduction of price had caused a diminution of rental equal to £1100, but he was happy to say their increased business had made up the whole of this and showed an improvement of £500 beyond. There was one circumstance alluded to in the report to which he wished to make especial reference: that was with regard to the fire which had occurred upon their premises in Dublin. As soon as the report of that occurrence reached the directors, they felt it to be their duty to send over a member of their own body to make inquiries into it, and one of the directors very kindly volunteered to go at a moment's notice. As was stated in the report, the expense occasioned to the company by that fire would be moderate, for it would not exceed from £800 to £1000. The actual expense if they had had any claim upon an assurance office would not have been more than about £600; but they had to pay certain gratuities in consideration of the services which were rendered to the company on that occasion. They had given a remuneration to the military who assisted, their own staff was actively engaged, and by means of the aid that was afforded, the fire was very shortly got under. But he thought the most important feature connected with that event was, that the supplying of the lights to the public was not interrupted for a moment during the occurrence of the fire. They continued to give the same light; and he believed that circumstance of the supply not having been for a moment interrupted, had raised this company higher in the estimation of the inhabitants of Dublin as exhibiting the resources which they had at command upon the occurrence of any sudden contingency. The report also referred to the considerable outlay which was contemplated at Dublin. That expenditure had become absolutely necessary. They were called upon to provide additional storeage capacity, and for that purpose a new gasholder was required. They all knew that when an article was cheapened, it gave rise to a greater consumption of that article. That was the case with gas in a very remarkable degree. More people used it, and the increased demand for gas involved the necessity of providing more storeage room, and of putting new and larger mains, as also additional retort power. When, therefore, the necessity of the case was taken into consideration, he did not think it would be matter of surprise to the shareholders that they were about to incur a somewhat heavy outlay. He was, however, happy to say that they had funds sufficient to meet that outlay without calling upon the proprietors for any further capital, and he believed that they would get a good return for the outlay which they undertook in Dublin. When he had the pleasure of addressing them at the last meeting, he stated that they had already laid out a considerable sum of money at Dublin; but, in looking through the accounts in order to show to the proprietors that that outlay had not been needlessly or unnecessarily made, he found that the increase of the gross rental during the last twelve years had been equal to 29 per cent., notwithstanding the price of gas had been reduced from 7s. 6d. to 5s. per 1000 feet. On the same occasion, he also pointed out that the net profits of the Dublin station, which he regarded as their sheet anchor, had increased by 30 per cent., and he had no doubt that the outlay which they now contemplated would result in a return upon the money expended since 1846 equal to 11 per cent. He particularly alluded to this subject, because proprietors might feel apprehensive that the directors were going to lay out a great deal of money; and he mentioned these facts to show what had been the result of previous expenditure in additions to, and improvements of, their works. There were doubtless proprietors present who were desirous to know what their retort power was. He was aware that some gentlemen were extremely anxious upon the subject of clay retorts, and who wished to see nothing but clay retorts used. He would therefore state, for the information of those gentlemen, that, according to the last returns, they had 139 long clay retorts in use in Dublin,—that was, retorts through and through, with two mouth-pieces. All these were fixed in their new retort-house. They had likewise 35 small clay retorts, which had been in operation during the last four years; and, although no credit had been taken for the value of those retorts, after having been four years in working, yet they were informed by their engineer that they would last certainly six months, and probably another year longer. (Hear, hear.) They had, in addition to these, 112 iron retorts in working, and they had a bed of retorts set according to a new plan invented and introduced by Mr. Anderson, an engineer, who was well known to many gentlemen present. It was a mixture of clay and iron retorts together. The directors believed the plan would answer very well, and, when they had had more experience in the mode of setting them, it was probable that they would have another triplet, or two more triplets, of those retorts. With regard to the wasteage or leakage of gas, it appeared to be about the same per centage as was reported to the proprietors on the last occasion—being in Dublin about 31½ per cent., and in Limerick about 30 per cent. These, he believed, were the principal points which he had to bring before the notice of the proprietors; but, if any question arose either out of the report or anything he had stated, he should be happy to give any further information which the proprietors might require. He thought it right to mention, which he had omitted to state before, that the fire to which he had alluded took place amongst four very old gasholders, which had been in use ever since the company was established. They were very small gasholders, being not more than 60 feet diameter, and were nearly worn out; and, therefore, it was so far fortunate that the damage occurred to a portion of their property that could not have lasted in use much longer, and which would have had to be replaced during the present year. So far, therefore, they were fortunate. But he ought not to omit to mention that they were very much indebted to the services of their agent and engineer, Mr. Sanders, who, at the personal risk of his life, and when all the other persons engaged at the fire were afraid to approach it, in the coolest manner climbed upon one of the gasholders, nearest to one filled with gas, and which it was feared would explode every minute, and with the assistance of another man placed the hose in it, and put out the fire. That, he repeated, was effected at the greatest personal risk to Mr. Sanders, of whose conduct the directors could not speak too highly. (Applause.)

Mr. PERRY said he had great pleasure in moving that the report and statement of accounts now presented be received and adopted. He regarded the report as an extremely satisfactory one—indeed, more so than he had hoped for, and he felt sure that it would meet with the unanimous approval of the shareholders present.

Mr. W. B. RHODES seconded the motion, and inquired whether the loss stated by the chairman arose from the escape of gas to the amount mentioned, or whether it resulted from the effects of the fire upon their property?

The CHAIRMAN replied it would cost about that sum to restore the gasholders to the state they were previously to the fire.

Mr. RHODES inquired what quantity of gas it was calculated was lost on that occasion.

Mr. BELL (a director) replied it was calculated about 100,000 feet were lost, which would be of about the value of £20. It only amounted to the contents of the gasholder.

Mr. RHODES further inquired whether the risk in the transit of coals by sea, from England to Ireland, was provided for?

The CHAIRMAN replied that, in this matter, the company were their own insurers. Every shipment of coals they made was charged with an amount of 2d. per ton for insurance. That amount had grown up until it reached £1000 to the credit of that amount as profit. But, inasmuch as losses might occur, they had this half year only taken credit for £100 out of that amount.

Mr. RHODES entered into several inquiries respecting the means that were taken to prevent the surreptitious use of the company's gas, in cases where the supply had been cut off from non-payment of rental, or other causes.

M. SANDERS (the engineer) replied to these inquiries by giving explanations as the mode of proceeding in such cases, from which it was shown that every precaution was taken to prevent fraud upon the company; whilst, at the same time, facilities were afforded for the resumption of the supply, upon compliance with the conditions required by the company.

Mr. GODFREY said he thought this was a fitting occasion to take into consideration the question of the purchase-money of the Cork works, because he apprehended that in the course of the present year the amount from that quarter would be sufficient to realize about 15s. per share. It was a question, how this sum ought to be treated—whether, inasmuch as it arose from the sale of a part of their works upon relinquishing a portion of their business, it should not be treated as capital and returned to the proprietors. He was aware that this course was not pursued when they disposed of the Millbay works, but that he believed was owing to the fact that they had outstanding bonds to a large amount, which it was desirable to pay off; moreover they were in fact almost without a shilling of working capital, and it was to raise that capital that the bonds were issued. It was, therefore, thought desirable not only to pay off those bonds, but also to place in the hands of the board a certain amount, of working capital, which it was considered would strengthen their position. He apprehended that the circumstances of the company were very different at the present moment, and he thought, having regard to their extended operations, the capital which they had in hand would be sufficient. The directors would probably consider what was the best course to be taken; whether the sum to which he referred should be carried to a separate account, or in what manner it should be dealt with until there was a sum sufficient to make it worth while to distribute it amongst the shareholders. Some observations had been made with regard to the profits of the Dublin station. Did he rightly understand the chairman to state that the return from that station amounted to 11 per cent. upon the whole outlay?

The CHAIRMAN: No; only upon the mere outlay since 1846.

Mr. GODFREY was anxious that there should be no misunderstanding upon that subject, as he believed the average dividend upon their capital was about 2 per cent. He was disappointed to find that the waste and leakage of gas continued to be so large as 31 per cent. For a long time past, they had been laying out money for the improvement of their works, and they had been induced to do so by the hope that was held out, that by laying down new mains there would be a very considerable reduction in the amount of the leakage, and that the outlay would be compensated by the more economical working of their business and saving of that wasteage. As far as the latter question was concerned, the outlay appeared to have been a failure, and he thought that was rather an unsatisfactory feature in the report. Their attention was called at the last meeting to the discrepancy in the quantity of coals on hand. He was glad to find that on the present occasion the calculation of the amount of coal in store had been more accurately made. He mentioned this, because it was a subject of the most vital importance. On the last occasion, it appeared that the surplus of coal was so large, that if the fact had been discovered before the meeting took place, it would have justified the directors dividing some 4s. per share more than was divided; or, if they had not thought it prudent to pay the additional dividend, it would have justified them carrying over £2000, or 4s. per share, to the stations contingency account, or some other account. That being the case, he need not say that it might have affected the value of their shares. A person who sold his shares with a dividend of 13s. 6d. would part with them at a lower price than if the dividend was 17s. 6d. Therefore, he thought it was desirable upon all occasions to ascertain as accurately as possible the quantity of coals in store.

A PROPRIETOR inquired whether their coals were conveyed by sailing-vessels or screw-colliers?

The CHAIRMAN replied, generally in sailing-ships. They had three modes of getting their coals; one was by sailing-vessels from the Tyne; occasionally when they were pressed, they could get them from London by screw colliers; and a third means was by the Carlisle Railway from Newcastle to Maryport. On some occasions, inconvenience was experienced from the sailing-vessels being detained at sea beyond the time anticipated.

Mr. BELL remarked that at one time a London gas company owned three or four steam colliers, but they had been sold.

Mr. PINKARD said the quantity of gas manufactured for which they got no return was a very important question to every gas company; and with reference to the large amount of leakage in their works, he thought some further explanation was required.

The CHAIRMAN said, fortunately Mr. Sanders was present; and he would be able to answer any inquiries upon that subject. Proprietors must remember that their mains in Dublin travelled a distance of about 140 miles, and the extended character of the district accounted in a great degree for the large per centage of leakage. Another reason was, that many of their mains were old and of small capacity. They were gradually replacing those mains with new ones of a larger size. The improvements contemplated would be carried out in a great measure with a view to reduce the present amount of waste and leakage of gas. If that reply to the honourable proprietor's remarks was not satisfactory, he would call upon Mr. Sanders to give such further explanations as might be required. He confessed he was himself disappointed that the leakage had not been brought down to a lower point.

A PROPRIETOR believed the leakage was not much beyond the average of other companies.

The CHAIRMAN thought in some of the larger companies in London, the leakage was nearly as much as their own.

Mr. PINKARD wished to know whether there had been any reduction in the leakage lately? At the present time, he certainly considered it excessive.

Mr. SANDERS said the per centage of leakage in Dublin had not been materially decreased. The waste of gas, so far as could be discovered, was not so much from the mains themselves. A system of testing the mains in lengths of about half a mile throughout the city had been adopted, by means of an apparatus which had been invented, and which enabled the proving of the mains to be carried out without opening the streets. During the last summer, he had given great personal attention to this matter, and everything that could be done had been done with a view of reducing the leakage. They had a very large number of public lamps which were distributed over a very extended district. In some parts, the lamps were 100, 200, and sometimes 300 yards apart, whilst in London the distance apart was about 60 yards. He had reason to believe that the leakage was chiefly from the service-pipes and not from the mains, which though small were generally in excellent condition. Upon taking up some of the original mains of the Hibernian Gas Company and the Oil Gas Company, he was astonished at the very sound condition in which he found them. He might add that their gas rental extended over a district of about 13 miles in length by 4 miles in breadth, and he believed one acre of ground in the neighbourhood in which they were now assembled yielded a larger rental than the whole of their very extended district in Dublin; and therefore their leakage must be calculated rather as a mileage leakage than as a per-centage leakage. Their mains run for a distance of seven miles along the bay, serving small towns in the neighbourhood, and from that district their returns were comparatively small. A reference to the reports would show a remarkable immunity from accidents by explosions; only two or three instances having occurred during the last five-and-twenty years.

Mr. VAN DE WALL inquired whether some of the loss of gas was not to be accounted for by the defective state of the old gasholders, to which the chairman had made allusion? When they were in a defective state, they would let out gas instead of keeping it in.

Mr. SANDERS did not attribute any great amount of waste to that cause, because the gasholders were always looked after. The gasholders which had been destroyed were to have been re-sheeted during the present year. In the last report it was stated that it would be necessary to re-sheet four gasholders, some of which had been originally put up by Mr. Peckstone, one of the earliest gas engineers. The leakage from the gasholders certainly had not been serious.

Mr. PINKARD did not consider the explanation satisfactory, and it appeared to him that no successful means had been adopted to reduce this large amount of leakage. He was aware that an extended system of mains absorbed a considerable quantity of gas, and there was loss from that cause. He thought, however, there must be some grand defect somewhere.

Mr. RHODES remarked, that the Phœnix Gas Company had taken up mains which had been in the ground, at Greenwich, for thirty years, and some of them were found to be as rotten as paper. That had caused a large amount of leakage in that portion of the district; but since the new mains had been put down the leakage was very considerably reduced.

The CHAIRMAN said their engineer attributed the leakage principally to the service-pipes rather than to the mains. Some few years ago, when he went closely into this subject, the leakage and waste was as much as 46 per cent. They had gradually brought it down to about 30 per cent., and he hoped shortly to see it as low as 25 per cent., which he thought was about a fair average of other companies.

The resolution for the adoption of the report was then put by the chairman, and carried unanimously.

Upon the motion of Mr. GODFREY, a dividend at the rate of 15s. per share, free of income-tax, was agreed to, payable on and after Monday, 2nd April.

The CHAIRMAN having announced that the business of the general meeting had now been concluded,

Captain SHEA, after expressing his satisfaction at the report which had been presented that day, proposed a vote of thanks to the chairman and the other directors, for the attention they had bestowed upon the affairs of the company, and for the satisfactory explanations which they had given.

Mr. SIMEON WARNER begged to say that when he came to the meeting he was not prepared for so favourable a report as that which had been presented to them, which showed the gradual development of the resources of the company, very much to the credit of the directors and the benefit of the proprietors. He was much pleased with the explanations which had been given by the chairman. With regard to the subject of leakage, he thought, in the hands of their able directors and engineer, all possible remedies would be brought to bear for their future benefit, and with great pleasure seconded the motion, which was unanimously adopted and carried with acclamation.

Mr. PERRY expressed his hearty concurrence with the vote of thanks to their directors, and the resolution was carried by acclamation.

The CHAIRMAN returned thanks on behalf of himself and the other directors.

Mr. PERRY said he hoped the position of extreme personal risk of danger in which Mr. Sanders had placed himself on the occasion of the fire, in his anxiety to save the property of the company, had not been overlooked by the directors.

The CHAIRMAN assured the honourable proprietor that the circumstances had not been overlooked by the directors; but he would state, to the great credit of Mr. Sanders, that whilst the directors felt called upon to give gratuities to the entire establishment on consideration of their services at the fire, that gentleman expressed to the directors his feeling that, as the head of that establishment, he had done no more than his duty; that he was very much gratified with the vote of thanks which had been passed upon him by the board, but, beyond that, he must be excused receiving any acknowledgment of the services he had rendered. (Hear, hear.)

Mr. VAN DE WALL thought it was especially due to Mr. Sanders, that an expression should be given to the high sense which the proprietors at large entertained of the services he had personally rendered on the occasion of the late fire upon their premises. He was glad to find that such an expression had already emanated from the directors, and he begged to propose a similar course on the part of the proprietors.

It was moved by Mr. P. VAN DE WALL, and seconded by Mr. T. W. PERRY—"That the thanks of the meeting be given to Mr. Gilbert Sanders, the company's agent and engineer at Dublin, for his courageous and energetic conduct in arresting the progress of the fire on the 19th December last, and for the judicious measures adopted by him on that occasion."

Mr. PERRY expressed his cordial concurrence with all that had been said with regard to Mr. Sanders's services.

Mr. SANDERS begged to return his grateful thanks for the manner in which his services had been spoken of. He would say, most unaffectedly, that it would have been painful for him to have received any more sub-

stantial acknowledgment at their hands. Their property was in his keeping, and he conceived he was bound by every consideration to protect that property by every means in his power. (Hear, hear.) He considered himself very much in the position of a captain of a ship, who, when the vessel was in danger, ought to regard no personal hazards whatever. He had done no more than his duty, and the vote of thanks which had been given him he regarded as the highest reward that could be conferred upon him. (Cheers.)

The meeting was then declared special; when, upon the motion of Mr. WARNER, seconded by Mr. VAN DE WALL, Henry Wood, Esq., was unanimously elected a director, in the room of Mr. Nicholson, deceased.

Mr. WOOD returned thanks for the honour which had been conferred upon him, and promised his best exertions to promote the welfare and interests of the company.

The meeting then broke up.

SALE OF GAS ACT.

DEPUTATION TO THE LORDS OF THE TREASURY.

On Friday afternoon, March 9, a deputation from the Gas-Meter Manufacturers of England and Scotland waited upon George A Hamilton, Esq., M.P., the Secretary of the Treasury, who was attended by Professor Airy, the Astronomer Royal, for the purpose of calling the attention of the Government to the injurious effects produced by the delay which has taken place in providing the models of gasholders for testing the measurement and registration of gas-meters, in pursuance of the third section of the Act of last session for regulating asures used in sales of gas.

The deputation was accompanied by G. S. Beecroft, Esq., M.P.; E. Baines, Esq., M.P.; and H. B. Sheridan, Esq., M.P.

Mr. MARRIOTT said: Sir, this deputation has originated from a meeting recently held in London of the principal meter-manufacturers of the kingdom, and I believe I am correct in saying that nearly every meter manufacturer of any note whatever in the kingdom was present on that occasion. That meeting appointed a committee to act for them in relation to what might be necessary to be done in reference to this deputation to the Treasury, and these gentlemen are now attending in consequence of your kindness in granting them an interview. The object of the deputation is to show, by means of representations made by these gentlemen, who are more practically acquainted with the subject than any other persons can be, that the Sale of Gas Act passed last session is an Act which is wholly practicable, and that no meter manufacturer throughout the kingdom sees any difficulty in relation to its being carried into operation, reading it in the sense in which they think it ought to be read. The only difficulty which has arisen at the Treasury in reference to the carrying out the provisions of this Act arises, as far as the public are acquainted, out of a report by Professor Airy, the Astronomer Royal. These gentlemen think, having read that report carefully, that the opinions of the Astronomer Royal, which are adverse to the facilities for carrying out this Act, are founded upon an error in the reading of the Act itself, and principally in reference to the third section. In that third section, the Act provides that certain models shall be deposited, such as are supposed by the Treasury to be necessary, at the Exchequer-Office; and the words of that section are, that such models shall be "models of gasholders" with indices, balances and apparatus, for the necessary testing of meters. The reading which the Astronomer Royal has put upon that 3rd section, is that some instrument which he calls a gas measurer with balances and apparatus should be deposited, and it will be found that almost all the difficulty which the Astronomer Royal discovers to the working of this act is attributable to this error. Of course, it would be hard to impute to the Astronomer Royal as a scientific gentleman of such high eminence—that there was anything very extraordinary in his misreading of an Act of Parliament, while other people of equal eminence have been liable to the same mistake. But the word "gasholder" in the 3rd section, is a word so well known in the trade, that it was thought impossible when this bill was before the legislature that any mistake could by possibility arise. It does not mean simply a machine for holding gas, as gentlemen practically unacquainted with the subject might suppose, but it is the name given to a machine, consisting of a moveable part, which rises as the gas is introduced from a machine holding water, in which it is immersed, and it is provided with a weight—over a wheel, and a weight suspended from a side rod, so that the part which rises as the gas is introduced, is balanced in such a way as to preserve an equal pressure in every position. In that form, the machine has been for many years used; in fact, almost ever since meters were used by gas companies, and meter manufacturers in their own manufactories so that nobody at all connected with gas-works or meter-making, could possibly misunderstand the meaning of the term. But, in order that there might be no mistake in the reading of the Act, it was provided that such gasholders should have all necessary and "proper balances, indices, and apparatus for testing the measurement and registration of meters." Now, it was supposed that when an ordinary gasholder—say a five feet one—with such improvements as modern science might introduce, and with the resources which the Treasury have at their disposal of consulting not only practical men, but men of such high scientific attainments as the Astronomer Royal, would, when deposited at the Exchequer Office, have put the whole kingdom in a position to carry out the provisions of this Act, and that it would be competent for the Treasury to deposit at their leisure a one foot and a ten feet or whatever other size they might deem requisite. It appears to be the general opinion that these three sizes are all that will be necessary, at least for some time, and that there will be no difficulty whatever in providing gasholders of this description perfectly capable of carrying out the provisions of the Act. Perhaps here it may be advisable to observe that in an Act which deals with a subject of such great difficulty, if you take it in a scientific point of view, you get rid of all difficulties when you look at it in its practical bearings. In passing this Act, the legislature did not intend to provide for all the niceties of scientific admeasurement, but that as regarded pounds, shillings, and pence, there should be a standard of practical accuracy, in order to put an end to the complaints of consumers that they were liable to be charged too much, and of companies that they obtained too little through the imperfections of existing meters. So much, therefore, as to the 3rd section. Then there is, as we conceive, another misreading of the Act. I believe that is the only other point of importance in the Astronomer Royal's report. He appears to have assumed that the 12th section must be controlled and limited in its interpretation by the section which provides for the testing of meters. Now, the testing of meters is generally understood in the trade to mean, passing gas or air through a meter and seeing that its measuring capacity—that is to say the part that holds the gas, is of correct dimensions. Then in order to ascertain whether the rate shown in the index is correct, that is to say, the registering part of the meter, that is another thing and altogether independent of the testing. The 12th section of the Act, says, that "no meter shall be stamped which shall be found by the inspector to register, or be capable of being made by any contrivance for that purpose, or by increase or decrease of the water in such meter, or by any other means practically prevented in good meters, to register quantities varying from the true standard measure of gas, more than 2 per cent. in favour of the seller, or 3 per cent. in favour of the consumer." These are the two main points of difficulty which have been raised, and it is contended by the gentlemen present that these difficulties do not exist, but that the inspector will find it a part of his duty to assure himself that the indexes to the counting apparatus are correct. There are a variety of ways in which the difficulty supposed to exist, in reference to the inspector assuring himself on this point, might be got rid of. It is suggested that the counting apparatus might be submitted to the inspector without the meters, in the first instance; it is a simple apparatus, and might be sealed by him, and so enclosed and attached to the meter that it could not be altered after leaving his hands, and that this counting apparatus might then be kept in the stores of the meter maker. Indeed, there is no doubt that arrangements might be made between the inspectors and themselves, by which all difficulty as regards testing the counting apparatus might be obviated. Then, sir, as to the effect upon the trade arising from delay in depositing the model gasholder, these gentlemen would be better able to speak than I am. I may say, however, that very serious inconvenience must arise to them by the stoppage in the trade at this busy season of the year, and, if there is to be any alteration in the present Act of Parliament, such a stoppage must take place because they will not know whether they may be making meters which will pass or not. With regard to the public, all the gas consumers would doubtless regret to see this Act thrown on one side, and that they were compelled to wait for an indefinite period, until another Act, upon some more scientific basis, were adopted. We believe, too, that the attempt to obtain any extreme accuracy in this respect might render impossible any legislation upon the subject. With regard to the present Act, I should perhaps say that the clauses have been made to follow, as much as possible, the clauses of the Weights and Measures Act; and even where there were some apparent difficulties in the way, it was still thought proper to adopt it for this reason, that the Weights and Measures Act was well known to all inspectors who were supposed to be the agents to be brought into operation, and that the county magistrates and justices of the peace, who had been accustomed to interpret those Acts, would be better able to deal with it in this form than in any other. It was thought, also, better to conform to the existing Weights and Measures Act, because, whenever Parliament, as it is supposed it will before long, takes into consideration the amendment and consolidation of all the Acts relating to the department of weights and measures, which is very necessary, this Act would come into the same category with the rest, and be dealt with with greater facility.

Mr. CROSLEY: I will not detain you, sir, for many minutes, because I think the object we have in view may be expressed in a few words. Those who are engaged in the trade are clearly of opinion that no gasholder, such as is described in this Act, has been deposited; and that the reason why the Act has not been brought into operation is, that there has been a misinterpretation as to the meaning of the instrument referred to in the clauses to which I have called your attention. The influence upon the trade which has been produced by this misinterpretation and delay is very great. At this season of the year, and from now until the autumn, gas-meter makers are generally employed in what is called manufacturing into stock for the forthcoming winter. They have to provide capital, and to employ a large number of hands in their business, in anticipation of the demands which will be made upon them. But, from the fact that gas companies will not now purchase meters from any manufacturer, except such as are required for immediate purposes, it throws the manufacturers into this difficulty, that they dare not manufacture into stock, because, in consequence of the report of the Astronomer Royal, and the letter from the Comptroller-General to the Exchequer, there has been a feeling produced that it is likely another bill will be brought into Parliament. Therefore, though these gentlemen, and those whom they represent, may go on manufacturing meters according to the existing Act, leaving the question of the gas-holder alone for the present moment, we do not know but that the legislature may alter the spirit and meaning of the law, and the consequence would be, they would run the risk of having to alter all these meters before another season. The effect, therefore, will be that they must either run this risk, or else stop all their works throughout the kingdom; and, if they adopted the latter course, when the next winter comes, the gas companies would be unable to procure meters for their consumers. You will see then sir, that the evil is a very serious one, not only to these gentlemen, but to the gas companies generally, and to the consumers of gas throughout the country. The manufacturers are losing business all this time, and their workmen, many of them with large families dependent upon them, will be thrown out of employment. Now all this difficulty is experienced throughout the kingdom, and bitterly felt by every manufacturer, and they are unanimously of opinion that it will result in this, if it is intended not to interpret the meaning of the word "gas-holder" in the way the trade understands it, they will be obliged to close their works until some new Act of Parliament is obtained. How long that may be, we cannot tell, but if there should be any opposition to the passing of an amended bill, it may be a distant period. The Act which was passed on the 13th of last August, was introduced on the 1st of April. After that, there was a dissolution of Parliament, and we may be subject to the same thing this year; it was again introduced on the 10th of June: towards the last, there was great opposition raised to it; and even when it came down to the House of Commons, a paper was put into my hands, showing an immense number of amendments which were intended to be proposed to it, and which were all to be introduced almost at the last moment. If we are this year to be exposed to all the accidents of an opposition which may arise to a new bill, we cannot possibly foresee how long it will be before we get the amended Act. We trust, therefore, that the present Act may be interpreted as we say it should be, and in a way in which the trade are satisfied it can be carried out, provided the Treasury will give us the gasholder, with proper balances, indices, and apparatus, as described in the third clause, which we have not yet got. I may mention that these are letters which I have received from mayors, town councillors, justices and clerks of the peace throughout the kingdom, applying to me for estimates for the apparatus necessary to carry out this Act. I am of course in candour bound to describe the gasholder, but also to say, "if you take it from me at present, I understand it will not be stamped at the Exchequer, though the Act of Parliament clearly requires it should be so." For, although there are three things lodged at the Exchequer, viz., the weight, the cubic foot bottle, and the transferer—all of which instruments I really believe to be essentially requisite for the purpose of the Exchequer, and I do not think either of them can be advantageously dispensed with—still I look upon every one of these three things as only instruments or tools to be employed in the verification of the gasholder described in the Act of Parliament. Now, to describe the transferrer as a gasholder is, in my humble opinion, to call a fork a silver spoon. It is about as nearly as correct a comparison as I can, in a popular way, give of it; and I believe the opinion of my brethren in the trade agree with me on the

point. We all know that it would be exceedingly inconvenient to attempt to take up soup with a fork, and that if at table we asked for a spoon, and were handed a fork, we should say that we had not got the instrument we wanted; and I consider we are just placed in that predicament by this interpretation of the language of the Act. I have a large amount of business in prospect which I cannot get, because the Act has not been complied with; and I feel that I and the trade generally shall be placed in a very perilous position, unless, upon consideration, the Treasury takes a very different view of the matter to that which at present we understand it does.

Mr. MARRIOTT: There is one important question, which perhaps you will bear in mind—Professor Airy, in his report, says the gasholder is not a portable instrument.

Mr. SHERIDAN: That seems to be his principal objection.

Mr. CROSLEY: As I have had the honour to address a letter to the Astronomer Royal on this point, I may say that I explained to him I saw no difficulty about it whatever, inasmuch as we have been in the habit of making these gasholders for some years past, and have sent them to the Midland Counties, to Ireland and the Channel Islands, to Germany, and other places, and have never had any apprehension of an accident arising, or any complaints from those to whom they have been supplied. I do not, therefore, see any difficulty as to their portability. One of the objections, as I have understood, has arisen from a fear lest, in taking the apparatus to pieces after its having been verified, packing it up, unpacking, and putting it together again, some parts might get out of order. That is almost tantamount to supposing that those who are interested in keeping this apparatus in order, would not do so. But the same remark might apply to any other weighing or measuring apparatus. There is not a weight in use in the kingdom but I could file a few grains off itw ithout its being detected, or a measure used by a publican but I could take the eighth of an inch from the top of it without its being discovered; and why, therefore, should there be any difficulty about a gasholder which is to be placed in the charge of a confidential person, who will be bound in heavy penalties to be faithful in the discharge of his duties? I dare trust that apparatus in his hands without the slightest apprehension. I should wish you, Sir, to understand that the object we have in seeking this interview is not entirely to say that further legislation may not be found necessary. The object, as I understand it, is this: An Act of Parliament has been passed, and we want that Act brought into operation. At present, we cannot try it, because we cannot get the gasholder promised to us. I am perfectly satisfied that further legislation is desirable in some points, but that, I think, might be done subsequently, by an amended bill. It is not because it has been discovered that, in some points, there is a need of improvement in the existing law, that that should be a bar to its being carried out. If it be so, it is impossible to say what the consequences will be, especially to the gas-meter trade and to the gas companies, as well as to the poor workmen throughout the country, who will be thrown out of employment.

Mr. SHERIDAN: What we want to know is, what are the reasons which have induced Her Majesty's Government to decline carrying out the Act? I have read the Astronomer Royal's report, and I cannot see any sound reason why the gasholder should not be deposited. Many Members of Parliament, who have received letters from their constituents on the subject, have spoken to me, and have expressed their amazement that the Act should be treated as a dead letter, or treated by the Government with a species of contempt which they cannot account for. A gasholder is described in terms common in the trade, and the Act specifically states, that it is to be deposited by a certain day. To me, the reason for its not being done, appears a mere evasion of the Act; and I cannot conceive what can have possessed Her Majesty's Ministers to have treated that Act as a dead letter. I am told that there is hardly a meter maker in the kingdom who would not have been able to make a gasholder as described in the Act, which would have enabled the district inspectors to have properly tested the meters. Now, the transferer is a very useful part of the machinery required by the Exchequer, and so is the bottle containing the cubic foot; but, by their being deposited, the intention of the Act is by no means carried out. If it is supposed that any particular interests are involved, or some alteration is contemplated, then, by all means let us know it. But, otherwise, I think some stronger grounds than I have yet seen urged should be stated for the non-compliance with the intention of the Legislature. I asked Mr. Laing, the Secretary of the Treasury, whether the Government had complied with the Act of Parliament, and he rose up in his place in the House, and stated distinctly that they had. You know, sir, that the forms of the House prevented my replying, or I should have explained to the House that they had not done so. It is my intention to put a further question to him upon the subject.

Mr. GLOVER: With respect to the gasholder, I may state that, so accurate an instrument is it in operation, that medical men use it in testing the lungs of their patients; and they carry it about in their carriages with them. It consists of a little tank with a bell inverted; and I think, if it is so accurate that it can be trusted for medical purposes, it is sufficiently so for the purposes of this Act.

Mr. CROSLEY: With regard to the three models at present lodged at the Exchequer, they are, to a certain extent, expensive apparatus. In delivering estimates in answer to my correspondents, who naturally wish to know what will be the cost of them, I guard myself in this way—I say the cost of copies of these models will be so much money, but I do not consider that, practically, they are any earthly use when you have got them, except as old metal, because they cannot be employed in testing gas-meters according to the Act of Parliament.

Mr. SHERIDAN: It has been stated that the gentleman to whom the Treasury referred this matter, corresponded with Mr. Crosley, to obtain from him certain information with regard to such machinery as he thought necessary, and that some person in the Old Jewry was employed who is not a gas-meter maker at all, and never had any experience with these machines. Not being able to make the bottle himself, he employed some one else in Smithfield, and so this machine has gone the round of the trade before the bottle was produced. I may be wrongly informed, but I believe that to be the case.

Mr. DEFRIES: I believe, Sir, that if it was resolved to carry out the Act as it is, there would be no difficulty in every meter maker complying with it; but, if the alterations in the scales and bottles are adopted, as explained in Professor Airy's report, every town would be obliged to have an inspector, who must be a man of considerable scientific attainments, and consequently would require a large remuneration—something like £250 a year; whereas, in some of these places, they could not afford to give an inspector more than £25 a year. It would be impossible, therefore, that the Act should be practically adopted in that case, unless by levying a very heavy tax upon the gas-meter maker or the companies. Now, that the companies should not be taxed in that way, is clear, for, where they are getting only 4s. or 4s. 6d. per 1000 for their gas, they are scarcely paying their dividends at present.

Mr. SHERIDAN: What objection would there be to allow the Act to come into operation and be tried upon its own merits. If it should turn out to be so defective that it will not work properly, let a remedy be devised when Parliament meets again, by passing a supplemental bill under the advice of the Astronomer Royal. If we are to believe the representations of this highly respectable body of meter makers, their trade will be seriously injured by any further trifling with this Act; and I should, therefore, strongly urge upon you, sir, to try it as it stands, so that you may discover what its real defects are.

Mr. VICKARY: The only thing which to us appears necessary to be done is, that the Government should allow a gasholder to be made—such an one as is known in the trade—and to be deposited as a model in the Exchequer. According to this standard those which were sent in to be tested would be tried, and if found correct returned to the parties stamped with the Government stamp. There is no difficulty; the thing is extremely simple.

Mr. DEFRIES: Hitherto the usual allowance for variation in meters has been from 1 to 1½ per cent. The range which the Sale of Gas Act has given us is 5 per cent., consequently we cannot err there; and we do not, therefore, in my humble judgment, require an instrument of such nice scientific accuracy. The one foot, or five feet, or even the ten feet gasholder, is sufficiently portable to be carried to any part by the inspector, and that is as fine an instrument as needs be.

Mr. HAMILTON: What is the smallest sized instrument?

Mr. DEFRIES: I should say a five or ten feet.

Mr. SHERIDAN: A ten feet is the most useful.

Mr. VICKARY: There is a gentleman here who will tell you that in Paris this method has been adopted by the Government, and the whole thing has been carried on satisfactorily both to the Government and to the meter makers, while it has thrown an ample protection over the gas consumers. Indeed it has been largely adopted by European Governments, and they do not see any of the difficulties which have been apprehended in this country.

Mr. HAMILTON: The explanation with regard to the counting apparatus was, that the 12th section contains all that is necessary to secure correctness.

Mr. SMITH: I am pretty well acquainted with what has been done in Prussia, Belgium, and Paris, as well as in England. In these matters, on the continent, nothing else is known for the purpose of testing gas-meters but the gasholder. When the meter manufacture was first introduced into Paris, the police authorities decreed that such an apparatus should be provided, and they sent a Government officer to each manufacturer's works to test the meters supplied by him, and, if correct, to stamp them. The standard gasholder, everywhere used, is just such an one as is described in the Act, and it has always worked well.

Mr. HAMILTON: I should like to say, in the first place, that it would be rather hard to impute to the Astronomer Royal the construction which has been put upon the three clauses, upon which the whole matter hinges. That matter was well considered, and it appeared that it would be very difficult to carry out the Act, supposing the construction put upon the word "gasholder" in the third clause meant that which it is technically. It was principally on account of its being considered that that machine was not a portable machine—that is to say, it is a machine, which, if brought to the Exchequer to be tested, would be liable, without any imputation of fraud, to derangement afterwards—that this objection was taken. The opinion of the Government was, that there was a difficulty as to the construction of that clause, and I am bound to say it was not the opinion of the Astronomer Royal only.

Professor AIRY: I entirely assented to it. I wish to say that the supposition about going to various parties, and with regard to the failure of the instruments, is not a correct one. They are as perfect as can be, and I never heard of any chance of mistake. I believe in their construction they may be considered as near perfection as anything can be.

Mr. HAMILTON: The Astronomer Royal, in his report, seems to recommend what you have urged, viz., that this machine, which you call a gasholder, is the only thing by which gas-meters can be tested.

Professor AIRY: I have expressed it so in my report.

Mr. HAMILTON: Therefore, the only question is, in what manner can this machinery be brought into operation in the best way? Is it consistent with the existing Act of Parliament, or does it require some futher legislation to justify the Government in affixing their seal, which, you know, does confer an important guarantee, upon which the public have a right to rely? If the stamp of the Exchequer is affixed to an instrument, the public have a right to consider that every means have been taken to render its correctness a matter of certainty. It is a serious thing to affix the Government seal to an instrument which, though correct at the time, is liable to derangement afterwards; and it was therefore suggested by the Astronomer Royal that, inasmuch as these "gasholders" were not portable, it would be desirable for the Government to consider whether the Act of Parliament should be altered so as to admit of their inspector going to the place and verifying it.

Mr. VICKARY: I think it would be well for a proper officer to be appointed at the Exchequer to stamp all gasholders brought to him, if found correct. It would be as easy as possible for them to be taken to the appointed place.

Mr. HAMILTON: Of course I need not say to you, gentlemen, that I see it is a matter of pressing importance to the numerous and influential body of manufacturers whose business is involved in this question. Having received the Astronomer Royal's report, inasmuch as this is a question affecting trade, it became our duty to refer the matter to the Board of Trade, which we have done, and we are every day expecting a report from them.

Professor AIRY read paragraphs 15, 16, and 20 of his report, and said: I have read these paragraphs that you may see that the question has been most carefully and amply considered. I would just remark, in reference to what fell from Mr. Defries, who seemed to think that a person of very high scientific attainments must be appointed in provincial towns, in order to verify the accuracy of meters, that I apprehend it will not be required at all. The gas-measurer must be examined with care, but it is done once for all.

Mr. VICKARY: I think you misunderstood Mr. Defries. He said that to do it with the gas "transferrer" would require a person of high scientific attainments; but a man of ordinary sagacity could do it with the gasholder.

Professor AIRY: I should not think of doing it with that.

Mr. HAMILTON: I would just observe that the Astronomer Royal goes a little further in his report, and adverts to a matter which was alluded to by a gentleman who spoke early. He says, "this I believe would be more satisfactory to the public" (speaking of the appointment of an itinerant officer). Then he says, "And I think it highly desirable that power should be given to their lordships to lay down instructions having the force of law, for the verification, and also for the use of the gas-measurer and standard gas-meter." The "gas-measurer" of course is what you mean by a "gasholder." Then he says, "It is, I conceive, impossible to provide by Act of Parliament for the cases which will arise in a matter so technical and so varied as this." I understood the remark made was to condemn any attempt being made to legislate upon minute matters of scientific accuracy, that those kinds of things do not admit of legislation. You see the observation of the Astronomer Royal agrees with your own.

Mr. SHERIDAN: If the Astronomer Royal's views are adopted, a simple

supplemental bill might pass, and the existing one might be acted upon, so as to give confidence to all classes, while that bill was passing through.

Mr. MARRIOTT: The meter makers would not be able to go on unless the Act of Parliament were allowed to be tried, and the defects shown by experience. By allowing it to take effect the trade would not be stopped, but if they have to wait until September for the passing of a supplemental bill, they may almost as well stay for another year. It is possible that such a bill would be opposed, and the passing of it delayed for many months. With regard to the apparatus which the Act contemplates, it should be remembered that the gasholder is to be stamped at the Exchequer-Office, and never go out of the custody of an inspector to be tampered with. If there is to be an itinerant inspector going round to stamp them, they may be altered the moment he has turned his back. It is not necessary that every gas-meter manufacturer should have a stamped gasholder. He may have one of the same capacity as the one at the Exchequer; he may have it tested by the local inspector; and he may have everything but the legal stamp, which will not be at all necessary for him in making his meters right. The principle of the Act, therefore, would be observed—that you would never allow the copies to go out of the hands of the Government officer—which is an immense safeguard.

Mr. SHERIDAN: There is much force in that. The Astronomer Royal's objection would be removed if an official were appointed to see that the gasholders arrived at their destination in that state which would enable the local officer to test the meters correctly. The instruments deposited here could always be referred to in case of dispute between the travelling official and the local officer. If you can get rid of the objection by appointing such an officer, I think it would be well.

Mr. MARRIOTT: No Act upon such a subject as this can be expected to be perfect in the first instance. But to say that a hollow instrument, like the bell of a gasholder, after having been inspected, is the only part which needs to be stamped——

Mr. CROSLEY: Yes, there is the scale.

Mr. MARRIOTT: The scale is fast to the bell, and that is the only part which, in the case of a large gasholder, needs go to the Exchequer at all. I say, to speak of that being altered after being stamped, is absurd. Every pewter-pot, which has been stamped, might be indented, it is true.

Mr. SHERIDAN: The only thing is whether, in the present state of matters, it would be well to attempt further legislation, considering that the Act itself being opposed last year, any amendment to it may be now, and that would cause delay.

Mr. HAMILTON: The difficulty at the present moment is, that unfortunately the carrying out of the provisions of this Act has been left to the Treasury; whereas, it ought to have been with the Board of Trade. The consequence is that it imposes upon us duties which it is scarcely possible for us to perform. The question being one which involves the interests of trade, it has been remitted to that board. We shall have their opinion in a day or two, and then it will be for the Government to say what action they can take in the matter. I will take care to impress upon the Government the importance of acting promptly, as I see the serious impediment which at present exists in the trade.

Professor AIRY: I would simply point to the 36th paragraph of my report, in which I say—

"36. With regard to local offices, I do not think it necessary that they should be furnished with the weight, or cubic foot measure mentioned in paragraph 8, except as an absolutely last resource in case of deadly accident, and then the want of them can be supplied by immediate reference to the Exchequer Office. The only one which appears necessary is the copy of the gasholder, and even this will not be required if there is provision for passing an itinerant gasholder from the Exchequer.

"But I think it indispensable that it be enacted that every local office be furnished with a gas-measurer, such as is described in paragraph 15 (A.), of capacity not less than five cubic feet, furnished with proper pipes, cocks, and other necessary apparatus, required in the testing of gas-meters, and having also conveniences for the supply of water and the control of its temperature, as well as of the temperature of the room. The use of a standard meter should be permitted. The decision on the adequacy of those equipments ought to be referred to an officer authorized for that purpose by the Lords Commissioners of her Majesty's Treasury."

Mr. HAMILTON: Do you concur generally in that explanation?

Mr. VICKARY: I have no doubt it will be gratifying to my brethren in the trade to find, by what has transpired at our present interview, that there has only been a misapprehension of the Act by the Astronomer Royal, and with a little explanation I think he accords with our views.

Professor AIRY: It seems to me that we are entirely agreed, and I believe any gentleman present taking this paper in his hands would say he assents to the whole?

Mr. HAMILTON: The main point to be considered is, whether it would be right that an instrument scarcely portable, or at least, if portable, subject to derangement, should be impressed with the Government stamp—whether it would not be misleading the public. This is a large question, and hence it was that the Government felt it would be impossible on their parts—not from any indisposition to carry out the Act.

Mr. BEVERLEY: The standard bushel measure is so stamped.

Mr. HAMILTON: Is there not a considerable difference between a simple measure like that and a complicated piece of machinery like a gasholder?

Mr. BEVERLEY: We say that the gasholder is an instrument which is as simple as possible, and all we ask is, that such an instrument may be deposited in the Exchequer, and that we may be allowed to try the Act. We will do our best, and if we find it will not work, we shall be ready and willing to assist the Government in pointing out how it may be remedied.

Mr. GLOVER: The gasholder is as simple as the bushel measure—there is only a bell, which requires to be stamped, and the scale.

Professor AIRY: There is one sole point of difference between the gentlemen present and myself, and that is with respect to the word "balance." That word has no meaning in English, except that of a beam and a pair of scales, and that I understood to be the meaning here; and it is a thing essential here in ascertaining the cubic foot, which is to be 62 pounds weight of water, and then you have to ascertain the space which that water occupies. Several gentlemen have spoken of "balances" as those things which act by chains; but they are counterpoises.

Mr. MARRIOTT: The word "balance" is more especially applicable to "counterpoise" than to a pair of scales.

Professor AIRY: It is the word always used for a pair of scales.

Mr. SHERIDAN: Would you think, Mr. Hamilton, that it would be well for us to see the Board of Trade on this subject?

Mr. HAMILTON: It strikes me that it would be well to see the President of the Board, for this is a matter which affects so directly the interests of trade. Really, the point of difference between us is very slender.

After some conversation in reference to arrangements for that purpose, the deputation thanked the honourable gentleman for his courtesy, and withdrew.

DEPUTATION TO THE BOARD OF TRADE.

On Saturday, the 10th instant, the deputation, accompanied by H. B. Sheridan, Esq., M.P., had an interview with the Right Hon. T. Milner Gibson, at the office of the Board of Trade.

Mr. SHERIDAN, in introducing the members of the deputation, said: The object for which they seek an interview with you, Sir, is to ascertain the views of Her Majesty's Government in reference to the carrying out of the Sale of Gas Act, which was passed last session. It seems that by the 3rd provision of that Act, the Comptroller-General is required to deposit at the Treasury an instrument called a gasholder, by means of which the inspectors appointed under that Act can test the correctness of the meters to be used throughout the kingdom. It is quite evident that at the time stated in the Act for that purpose no such instrument had been deposited, and I consequently asked the Secretary of the Treasury in that case the reasons for not complying with the intention of the Legislature. To my inquiry, Mr. Laing stated that the Government had complied with the terms of the Act, although, as I have said, no such instrument as a gasholder had been deposited. A great deal of discontent has been exhibited by the gas-meter trade throughout the country, who are very anxious to know what are the intentions of the Government upon the subject, because, until something is done, the whole of their works are necessarily suspended. A large and influential meeting of the trade has just been held in London, at which a strong feeling was manifested with reference to the non-compliance of the Government with the provisions of the Act, and a resolution was passed that a committee of their number should form a deputation to wait on the Government, with the object of ascertaining their views.

Mr. M. GIBSON: Have you got a copy of the Act with you? What is the clause referred to?

Mr. MARRIOTT (handing up a copy of the Act): It is the 3rd section.

Mr. SHERIDAN: It appears that the Treasury referred the matter to the Astronomer Royal, in order to get his report as to the practicability of the Act, and Professor Airy has made a report, which probably you have seen, in which he expresses an opinion that it is advisable inspectors should be appointed to visit the localities in which the gasholders tested according to the Government standards, and stamped as correct by the Exchequer, are used to see that when they arrive at their destination they shall not have become out of order. He seems to think that if they had the Government stamp upon them, they would be taken as correct, and that the public might thereby be deceived in consequence of their having become defective since they were tested. He proposes, therefore, that the public should be better protected by a system of travelling inspectors. The question then arises, whether this can be done without another Act of Parliament, and whether, if a bill were introduced for the purpose, it might not be so opposed that the whole thing would be hung up for some time to come. We think, however, that if you would take upon yourselves the responsibility of appointing an inspector upon the suggestion of the Astronomer Royal, the present Act might be brought into operation; and our object in coming to you is to urge the propriety of your doing so, and thus give an opportunity of seeing whether it is practicably workable. If it should be found not to be so, we could then go to Parliament in the ensuing session to obtain an amendment of the Act.

Mr. GIBSON: Just explain to me what the Act requires to be done?

Mr. SHERIDAN: The Act requires that a gasholder, which is an instrument well known in the trade, should be deposited by the Treasury in the office of the Exchequer, by which other gasholders could be made to enable the inspectors throughout the country to test meters; and if no such gasholder is deposited, there can be no means of knowing what to use.

Mr. GIBSON: The gasholder to be deposited is to be the model for others?

Mr. SHERIDAN: Yes. Those by which meters throughout the country are to be tested, are to be made according to the one deposited with the Exchequer. But, in addition to that, the Astronomer Royal suggests that an inspector should be appointed to see that, after having been tested, these gasholders are kept in order.

Mr. MARRIOTT: The course adopted in the Act is that which for many years has been adopted in reference to weights and measures. Take a bushel, or any other measure of capacity—the course is, at the Exchequer, to make a model bushel. Then copies of that model are tested by a certain process, and, being verified, the tested vessel, which is a brass instrument, is sent to the inspector, and he uses it in verifying all others before he stamps them in the locality to which he is appointed. What is proposed by this Act is to follow precisely the same course with regard to the gasholder, which is a simple hollow instrument like a bushel measure, the part which is called the bell rising and falling in a cistern, which may be anything; but the important part, which carries the cubic foot, is simply one instrument, which might be tested just as a bushel is tested, and that and the scale upon it being stamped, might be sent down into the country to the inspectors for them to verify the gas-meters by. I speak, Sir, as the organ of these gentlemen, when I say that this Act was drawn to meet a practical difficulty; and it must be admitted that, if it is to be looked upon purely as a theoretical and scientific matter, and correctness in infinitesimal particulars is to be looked for, it will be impossible to legislate upon the subject. At a meeting recently held, and which was attended by the principal meter makers in the kingdom, the resolutions which have been placed in your hands were agreed to, and a committee was appointed to wait upon the Treasury, and also upon you, to urge the prayer of their memorial. The object of the deputation is to state to you, that those who have been all their lives long engaged in the business, and have had to do daily with gasholders, consider that the Act can be practically adopted, and they are completely taken by surprise when they are told that it is inoperative. I hold in my hand a letter from Manchester, which states that the magistrates there have received a communication from the Comptroller-General to say that the Act is a delusion, and they have accordingly postponed the appointment of a gas-meter inspector *sine die*. I believe it is so throughout the country, and the consequence is that the gentlemen now before you, and those whom they represent, have been obliged to suspend their operations, lest the meters manufactured by them should not be according to law. They are prepared to manufacture meters in accordance with the existing Act of Parliament, and they see no difficulty in doing so; but at the last moment they are told that there must be further legislation, and that they must suspend their business until next September at the earliest, and—considering how uncertain such matters are—possibly for ten years to come, for if this matter is to be dealt with upon such minute scientific principles it will be utterly impossible to frame a bill.

Mr. GIBSON: Was there not an explanation given why the Act was considered impracticable?

Mr. MARRIOTT: I am just coming to that; and we say that that explanation or reason is founded upon two great errors. The first error is in the reading of the 3rd clause, which requires model gasholders to be deposited. Gasholders are instruments as well known by meter-makers throughout the kingdom as a bottle is to a dealer in spirits. It is an instrument which has

already been described; and, in the clause itself, lest there should be any mistake respecting it, it is added, "with proper balances, indices, and apparatus for testing the measurement and registration of meters." One would have thought that this would obviate all difficulty respecting them, but notwithstanding the clause has been so construed that Her Majesty's Treasury and the Comptroller-General are convinced that they have complied with the Act without depositing any gasholder at all. Now, Sir, all that is required is, that there should be three model gasholders deposited of various sizes.

Mr. SHERIDAN: Of the same sort, but of larger and smaller capacities.

Mr. MARRIOTT: It was only anticipated in passing this Act that scientific men would be consulted for the purpose of seeing that these gasholders were made as carefully as possible. But the instrument itself is perfectly well known, and it is made to that degree of scientific accuracy that the medical profession have used it to measure the capacity of the chest in diseases of the lungs. This delicate instrument is carried about by them wherever they go, without fear of derangement, and there would be no difficulty whatever in their being brought to the Exchequer to be tested, and, being found accurate, taken back again without any damage whatever. But if there should be any doubt upon this point, it is quite competent to the Government to say it would be better that these instruments should be examined *in situ*, and we will appoint an officer to examine them there from time to time; but certainly that is no reason why this Act should be suspended. The next error is in the 12th section, which requires that the inspectors shall not stamp meters which are capable of registering or can be made capable of registering quantities of gas except within the prescribed limits, that is 3 per cent. in favour of the consumer, or 2 per cent. in favour of the seller. We contend that the meaning of that is, that the word "register" points directly to the counting apparatus, and that the inspector must examine the registering apparatus, and satisfy himself that it performs its office. But instead of that, we are told that this Act cannot be carried into effect, because there are no means of testing the registering apparatus. If it is the duty of the inspector to test this apparatus, it follows that the trade will furnish him with the convenience for doing so, and the meter will be in such a state that it can be tested. If they are not, he will say, "Take these meters back, for I cannot stamp them." It is simply a matter of convenience between them. And now, Sir, as part of that same mistake in construing the Act, it is contended that the rules for testing meters embrace only a part of the duty of the inspectors—testing is one thing; seeing that the registration is correct is another. There are certain rules laid down in the Act for testing meters, but they do not at all dispense with the necessity of looking at the counting apparatus. These gentlemen will tell you that there is no difficulty whatever with reference to the counting apparatus, and that it may be tested either by sending it separately from the instrument, or else by some other equally practical mode which will easily suggest itself.

Professor AIRY: You are aware that I have said so in my report.

Mr. SHERIDAN: Would it not be better for the Astronomer Royal to state what his views are?

Mr. GIBSON: I think it would be desirable.

Professor AIRY: The gentleman who has addressed you has spoken correctly when he said there were two points under discussion, each of which stands upon its own merits; but I would wish to make a remark upon an observation dropped by him in the early part of his speech, in which, speaking of the difficulty in which the country was placed by Lord Monteagle's comments upon my letter—he said the Act was regarded as little else than a delusion. Now, Sir, that remark applies not to the first part but to the second, and I shall be glad to know that such is not the case. The Act generally is drawn, and I think with great propriety, upon the model of the Acts relating to weights and measures in other respects; but if I might express my own opinion, I would say that I do not think there has been quite sufficient attention paid to the remarkable difference which exists between weights and measures in general and gas-measuring apparatus. This instrument, which has been called by me a gas-measurer, and which has been supposed to be the thing commonly called a gasholder, has been compared to a bushel which is stamped at the Exchequer, and is then used as an authenticated instrument, and is available for the examination of the bushels of private individuals. But there are, practically, very important differences between them. The bushel is not a large thing as compared with the bell of a gasholder, and it is infinitely stronger: it is made of cast metal of considerable thickness, instead of being the thin plate of which the bell of the gasholder is constructed. But what is more important still is, that the bushel is a simple instrument—given that thing, and the thing is complete. But here the correctness has to be authenticated in three respects: first, you have to see that the bell itself is of correct capacity; then that the scale is a proper one; and then, third, that certain counterpoises, which are called "cycloidal counterpoises," are maintained in the same state, or the authentication is of no avail. It appears to me that an instrument of this kind brought, say from Carlisle, and authenticated, and then taken to pieces and sent back to Carlisle, is not the same instrument that was authenticated, and in a matter of so much importance I would not give a pin for such an authentication as that.

Mr. GIBSON: You think it should be inspected afterwards.

Professor AIRY: The testing which is worth having is when the instrument is complete and in its place.

Mr. SHERIDAN: But the gentlemen in the trade agree with you in this respect, and that objection would be got rid of by appointing a travelling inspector.

Mr. GIBSON: Is that the whole of the first point.

Professor AIRY: No it is not quite the whole: allusion has been made rather pointedly to the "balances" referred to in the 3rd section. We read that word in two different senses. I read it as a pair of scales, which are indispensably necessary in the operation presented here for obtaining the measure of a cubic foot. I understood from Mr. Marriott that certain things called counterpoises were what is intended, but that is not the English meaning of the word, nor the meaning used in drawing up this Act, nor in any dictionary in the world. I understand it to be a pair of scales, required to ascertain the cubic foot of water, and which therefore forms a necessary part of the equipment of the Exchequer in reference to this Act. I think it is proper now to explain how it is that we have been led to think that would not properly be that instrument which Mr. Marriott is disposed to regard it, as "gasholder" is not a specific but a general term, and may be applied to different kinds of things. In the process of preparing apparatus for the examination of meters, there are these distinct steps to be taken. First you must have a weight of 62 pounds; secondly, a bottle of water which will hold a cubic foot; third, by means of the bottle and weight you must use a transferrer, which we now call the gasholder; and further, you must have this bell instrument which has been spoken of, and which is the only convenient and good instrument to be used in the various localities for testing gas-meters. Now, the Act of Parliament only alludes to three things—it alludes to the weight, the cubic foot, and the gasholder. Then, when we come to consider this Act, inasmuch as there are two instruments required, and the Act only speaks of one—the gasholders—the question is, what are we to do? and it becomes a matter of practical convenience and accuracy. I maintain that the proper thing is the one which is called the transferrer, because that is an instrument which, being verified at the Exchequer, can be sent to all parts of the kingdom, and used to verify the fourth instrument, viz., the gas-measurer. With regard to testing the meters, the words which I have used in my letter, and which are the foundation of Lord Monteagle's remark, that the operation becomes little more than a delusion, are these. In paragraph 27 of my letter I say:—"The question, whether the amount of passing gas is duly recorded on the three-dial plates is now separated into two questions; namely, whether the amount of passing gas is duly recorded by the index-drum; and whether the record on the index-drum agrees with that on the three dial plates? The first of these questions can be answered with all desirable accuracy, by the usual reference to the inspector's gas-measurer; but to the second, no answer can be given. Neither the gas-consumer nor the meter-inspector ever examines the wheel work which connects the index-drum with the dial plates; nor could they do so if they desired it, the wheel work being so enclosed in a box as to be beyond the reach of examination." That I state as a fact which I can answer for, as I have seen the examination of meters both in public and in private. Then the particular expression I have used here is one which will depend upon a legal decision as to its accuracy or inaccuracy. The Act, which uses the general word "testing," without any description of the process, must be interpreted, I presume, as sanctioning the process in ordinary use at the time of its enactment; and it cannot therefore be cited as compelling any examination of the connexion between the index-drum and the dials. Now, if I am wrong in that, so much the better, as it will save further legislation, and give accuracy to the operation. I apprehend, however, that I am not wrong, though I shall be happy to find out that I am; and if by the authority of Government the terms of the Act can be explained as to show they comprehend that, and it can be made the duty of the inspector to go through such an examination, it will be a matter of satisfaction to me. Then, finally, I will say this, as to the necessity of making the real verification of the gas-meter depend upon a travelling inspector, my opinion is unchanged, and I think that that is the only way in which it can be made good and respectable. I fully understand the difficulty which these gentlemen have alleged as to the calamitous consequences from any impediment to the working of their trade by a suspension of the operation of the Act, and I think if it could be kept in view that, if not doing the very best thing that can be done, we are doing the best under the circumstances of the present time, it would be well that the views expressed by Mr. Marriott should be complied with; that what he calls a "gasholder," should be provided at the Exchequer simply to satisfy appearances, as a palliation of an evil, and to keep things going for the present, still with the intention ultimately of verifying the gas-measurers each in their places.

Mr. SHERIDAN: The difference between us is very slight; one calls it a gas-measurer, the other a gasholder; the Astronomer Royal does not find any fault with the instrument.

Professor AIRY: It is a most excellent instrument.

Mr. SHERIDAN: Upon that point there is no difference between us. The only question which the Board of Trade have to consider, is the propriety of appointing a travelling inspector, or of suspending the Act and ruining the trade. If it is attempted to pass another bill this session, the Scotch members would be sure to oppose it, and serious delay must be the consequence.

Mr. GIBSON: How can we appoint these travelling inspectors—have the Government any power to do so?

The SOLICITOR of the Board suggested that it might be done under the provisions of the 6th section, which spoke of "some other officer."

Mr. MARRIOTT: We do not think it necessary, but if, as suggested by the Astronomer Royal, it is thought advisable, it might be done. The necessity certainly applies with no greater force here than with ordinary weights and measures. It has been said that the bushel measure is a smaller instrument than a gasholder; but that is not the case—the one foot-meter being 62 and the other 80 lbs. These gentlemen will tell you that they never heard of one getting damaged in travelling to its destination.

Mr. GIBSON: Well, gentlemen, with respect to this department being consulted in the matter, I do not understand that it was contemplated by the Act. It more properly rests with the Treasury, who have analagous duties to perform. I do not know how it arose that this department was referred to.

Mr. SHERIDAN: As it affects trade, Mr. Hamilton thought it came within your department.

Professor AIRY: And it was suggested by Lord Monteagle.

After some further conversation—

Mr. GIBSON said: I think you had better leave the matter where it stands. I am now, I believe, in possession of the case, and will consider what can be done. It is impossible, in the first place, to give a decision at once, because it will have to be settled whether the Board should undertake this duty; and secondly, if it is so decided, I am not sure that we have authority in the Act to do what is necessary. It does not appear to me that we have the power to appoint an inspector, whoever else may have it. It is a matter concerning which it is impossible to give an off-hand answer; but we will consider it immediately, and see what can be done. It has come before me now for the first time, and it is therefore quite new to me.

After some further conversation, the deputation thanked the right honourable gentleman for his courteous attention to their representations, and withdrew.

THE OXY-HYDROGEN LIME LIGHT.

The *Journal of the Society of Arts* of the 2nd instant, contains the following correspondence on the subject of Mr. Squire Baxter's paper on the lime light.

"Sir—On perusing, in your *Journal* of the 24th, an account of the discussion which followed the reading of my paper, when I was unavoidably absent, I was happy to find, from the closing remarks of your distinguished chairman, that all who took part in it were of opinion that, for certain objects, it might be an extremely valuable application of light; that in cases were intensity of light was aimed at, it accomplished that object in a very successful manner; that, with regard to its purity, they had seen it to be complete and perfect; and that the difficulty which formerly existed in respect of its continuity had now been got over; in fact the light was there exhibited to speak for itself in testimony of these most important advantages, claimed for the improved lime light by me in my paper, on behalf of the inventor.

"The principal difference of opinion which existed at the meeting appeared to have been as to the cost of the oxygen gas (the principal element of expense of the light), and to this point I will with your permission address myself, for the satisfaction of those who take an interest in the matter.

"As one fact is worth many opinions, I beg to acquaint your readers that an offer has been made, by responsible parties, to the directors of the Universal Lime Light Company, to contract with them for the supply of oxygen gas at three farthings per cubic foot, or £3. 2s. 6d. per 1000 cubic feet, which offer they have not as yet accepted, as they expect to receive other tenders on more favourable terms. It is obvious that the company could produce the gas at less than three farthings, as that price carries with it transport and profit. Indeed, more recently, an offer has been made to them for supplying this gas at a price not exceeding that of coal gas.

"I am in possession of much valuable information and experience relative to the generation of oxygen gas, and selection has been made of the best means suited to the purpose of the company, which it is, however, inconsistent with sound commercial principles to make public.

"These facts are sufficient to show how careful professional men (especially) should be in putting forth statements as facts, which, after all, are but opinions based on very questionable data and insufficient knowledge of the subject, often tending greatly to mislead the public. These facts also show that the realization of the expectations formed with regard to economy was something more than a probability, and they were in a measure confirmed by the statement made to the meeting, of which I was long ago cognizant, that Mr. Michiels, a gas engineer and German chemist, of great practical knowledge and skill, had produced (on the large scale) oxygen gas, by passing atmospheric air over hydrate of baryta, a process so economical as to enable him to produce oxygen gas at about the same price as common gas, say 5*s.* per 1000 cubic feet.

"To show still more palpably the truth of my statement (in showing that the lime light might be supplied at one-half the price of ordinary coal gas), the economy of the light may be rendered in a simple form, by taking the cost of the oxygen gas at £3. 2s. 6d. per 1000 cubic feet (the maximum price offered) and coal gas at 4s. 6d. per 1000 cubic feet, from which the cost of the combined gases (equal in quantity) supplied to the lime light may be obtained, viz., £1. 13s. 6d. per 1000 cubic feet, or in proportion to the price of coal gas, as 401 : 54, or as 7·44 : 1 in favour of coal gas. But as the relative consumption of the gases in the lime light and gas light, for equal effects, is, from the superior intensities of the former, in the ratio of 8 : 400 or as 1 : 50 in favour of the lime light, it is obvious that the economy of the two lights is in the ratio of 50 : 7·44, or 6·7 : in favour of the lime light, neglecting the cost of the lime, which is trifling; that is, the cost of the lime light is a trifle less than one-seventh of its equivalent in gas.

"This is so simple a calculation that it can be appreciated by any one even slightly versed in the subject; and it is most unaccountable that men whose professional knowledge should enable them to anticipate these results, should commit themselves to such serious errors as those enunciated at the meeting of the 22nd.

"With regard to the specimen lamp, which was placed in the society's room on that evening, with a view to illustrate its applicability to the lighting of large rooms and the illumination of paintings, without either the oppressive heat or the contamination or deterioration of the atmosphere usually attending the use of gas lights, a very striking instance of these facts was afforded to the meeting as soon as the ordinary chandelier was re-lighted. The economy, as stated by Mr. Hawes, was substantially correct. The cost of the gas chandelier, which contains (as I was informed) about 275 jets, each consuming about 4 cubic feet of gas per hour, or 1100 cubic feet of gas in the aggregate, at a cost of 4s. 6d. per 1000 cubic feet, was 4s. 11½d. per hour. The lime light (as there exhibited) consumed at a maximum, 40 cubic feet per hour (though I believe it did not exceed 35 cubic feet) of the combined gases, which, at £1. 13s. 6d. per 1000 cubic feet, as before stated, is 1s. 4d. per hour; but this light was equivalent to at least 400 gas jets, each consuming 5 cubic feet per hour, or, in the aggregate, 2000 cubic feet, which, at 4s. 6d. per 1000 cubic feet, is 9s. per hour. Hence, the relative cost of the two lights is as 9s. : 1s. 4d., or in the ratio of 6·7 : 1, as before stated, in favour of the lime light, which, I submit, is sufficient to show the erroneous character of the calculations placed before the meeting.

"It was remarked that the extreme intensity of the light was painful to the retina of the eye, but it should have been added that glass shades were as available for the lime light as for gas, for similar reasons and with similar results. In like manner, when a gas or other light suited to large spaces is too powerful for a smaller space, it is very naturally reduced to the required volume; and so with the lime light, which admits of its 'rushlight' as well as its maximum brilliancy.

"With regard to a remark made as to the safety from explosion, I beg to say that the well-known precautions, viz., wire-gauze discs, which have successfully prevented such accidents during the last forty years' use of the lime light, have been adopted by the company as a safeguard against such occurrences, which, indeed, are less likely to happen than with gas backed by the gasholder of a gas-works, except when protected by proper appliances and attention.

"I may conclude my remarks by stating that in presenting the improved lime light to the public, the directors of the Universal Lime Light Company do so neither unadvisedly nor precipitately; they know the value of the improvements possessed by them, which have so successfully contributed to the perfecting of this light.

"Since the reading of my paper on the 22nd instant, intelligence has been received that during the storm of the evening of the 21st, at Liverpool, the lanterns which enclosed the lime light on the south landing stage were completely denuded of their glass casing; the lights, exposed to snow, sleet, rain, and wind, remaining perfectly steady and undiminished in brilliancy—a fact which deserves recording.

"I am, &c. "S. Squire Baxter.

"*Feb.* 28, 1860."

"Sir—I am afraid I did not express myself very clearly on Wednesday evening, when, in the discussion on Mr. Baxter's paper, I spoke of the calculated value of the lime light; for although my estimate of its cost, as compared with the price of coal gas, was as nearly as possible in accordance with the practical valuations of Dr. Bachhoffner, yet many of the speakers so far misunderstood me as to fall into the error of supposing that our results were very dissimilar. Mr. Hawes, for example, in commenting on them, said, 'they (Drs. Bachhoffner and Letheby) were as far from each other in their calculation of the cost [of the light] as either of them was from the author of the paper;' and the learned chairman, in his concluding address, observed, 'that they had had an illustration that evening of a topic which was presented to them a few weeks ago, as to the difference of opinion which existed amongst scientific men.' When, however, it is stated that the actual difference in our valuations amount to but a small fraction (less than 0·5 on 2·6), it will be manifest that our modes of comparison, as well as our general conclusions, were not at all understood. I am anxious, therefore, to set the matter right, and, if possible, to make it intelligible.

"Dr. Bachhoffner found that when the lime light was obtained from oxygen and coal gas, and an illuminating power of 25·9 argand burners, each consuming 6 cubic feet of gas per hour, its cost was 1s. 10½d. per hour, whilst coal gas of the same power would cost but 8½d. These numbers are in the proportion of 2·6 to 1, and mine, as will be presently seen, are from 2·5 to 2·1 to 1.

"It is hardly necessary to discuss that which is so fully reported at page 229 of the *Journal*, viz., that 220·6 pounds of chlorate of potash are required to produce 1000 cubic feet of oxygen, for this is not a matter of speculation, but is a rigid fact, founded upon the laws of chemical combination; and it matters not whether the gas is produced in a small glass retort for experimental objects, or generated in larger quantities for commercial purposes, the ratio of proportions will always be the same, for it is the ratio of the chemical equivalents.

"At the present time, the wholesale price of chlorate of potash is 1s. per pound, and therefore 1000 cubic feet of oxygen would cost £11 for merely the raw material; but, supposing that an increased demand would reduce the price of the chlorate to 10d. per pound—even then the oxygen would cost £9. 3s. 10d. per 1000 feet. Coal gas, however, is produced at something less than 1s. 6d. per 1000; and if the lime light is to compete with coal gas as an illuminating agent, its power should be as much greater than that of gas as the prime cost of the one is from the other—that is, as £11 or £9. 3s. is to 1s. 6d. Supposing, therefore, that both are burnt at the rate of 6·5 cubic feet per hour, the lime light should have a power of from 147 to 122 times that of coal gas—these being the ratios of 1s. 6d. to £11 and £9. 3s.; but according to Mr. Baxter's table (p. 229) the lime light, even under the best circumstances, as when the oxygen is burnt with hydrogen, has only 58 times the power of coal gas (the numbers are, lime light, 1167 candles, coal gas 20·18). It is clear, therefore, that upon these data the relative cost of the lime light and gas light is as 2·5 to 1 in the first case (£11 per 1000), and 2·1 to 1 in the second (£9. 3s. per 1000), numbers which are not very far from those given by Dr. Bachhoffner, namely 2·6 to 1, and they would have been still nearer if the cost of the other materials had been considered; but it is unnecessary to complicate the subject with questions concerning the cost of the hydrogen which is required to burn the oxygen, or the lime and its cage for producing the light, or the fire and the apparatus for making the gas, all of which have been disregarded in the preceding estimates; for, if it is shown that one of the materials will cost more than double its equivalent of power in coal gas, there is no need for further investigation.

"I am, &c., "Henry Letheby.

"*College Laboratory, London Hospital, Feb.* 25, 1860."

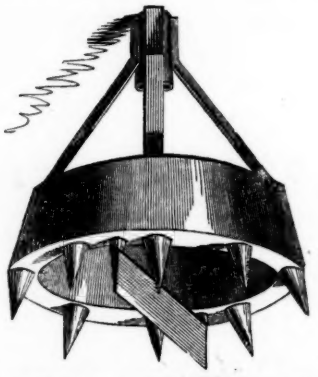
SMITH'S IMPROVED GAS-PIPE TONGS.

The *Scientific American* draws attention to an improvement in tongs, or nippers, for grasping and holding or turning cylinders, whether solid or hollow, particularly designed for gas tubing, invented by Mr. George Smith, of New York, which is represented in the annexed cut:—

The metal bar or handle, A, has the hook or claw, B, secured in the slot, *i*, by means of the pin, *d*. This pin has a groove, *e*, around its projecting end in which groove the spring, *e*, fits so as to hold the pin in place. The pipe is grasped between the edge, *m*, of the end of the bar, and the curved end of the hook. The end of the bar is inclined at a small angle from a right angle; so that when the hook is placed in the slot on the opposite side of the bar, the distance from *n* to the end of the hook will be less than the distance from *m* to the end of the hook, and thus the implement will be adapted to grasp a cylinder of smaller size. Several hooks of various sizes are furnished with each bar; and the peculiar arrangement of the pin, *d*, and the spring, *e*, renders the changing of the hooks a very quick and easy operation.

IMPROVED ARTESIAN WELL-BORING INSTRUMENT.

A correspondent of the *Scientific American* describes an instrument employed by him in sinking through hard rock. In its simplest form, it is merely an iron cup, with pieces of tempered steel, as teeth, fixed in it by means of fusible metal, the points projecting and spreading a little wider than the edge of the cup. For large borings, the cup has no bottom, but the sides are very thick, allowing a hollow ring, or groove, to be scooped out to nearly the depth of the cup, and in this ring the teeth are placed, the points of the teeth projecting about two inches, and extending a little over the edge, as shown in the annexed cut:—



This bottomless cup allows a free passage for the water, &c., to pass through, while in the act of working. A single chisel is fixed across the centre of the cup. When the teeth become blunted or worn, they may be taken out of the cup in a few minutes, by simply melting the fusible metal, which is composed of 8 oz. of bismuth, 5 oz. of lead, and 3 oz. of tin, the lead being first melted, and the other materials being then added to it. The original temper of the teeth is not impaired by the heat required for melting the fusible metal, and

the teeth, after having been sharpened, may be reset with an iron ring under them as a lifter. They may be either round or square, but must be all of an equal length, and, of course, pointed or tapered, according to the nature of the rock to be bored.

THE METROPOLITAN GAS SUPPLY

WESTMINSTER DISTRICT BOARD OF WORKS.

FRIDAY, MARCH 9.

The Ordinary Meeting of the Board was held this day—Mr. LOWNDES in the chair.

After reading the minutes of the last meeting, the subject of affixing the seal of the board to petitions to Parliament in favour of the proposed bill for regulating the metropolis gas supply, was considered and ordered to be again postponed until the bill is introduced.

Mr. GODSON had given special notice of his intention to move "then and there, notwithstanding any rule, bye-law, resolution, or act of the board to the contrary, to sign a cheque for £90 voted by this board on the 13th day of January last, towards the expenses of the Gas Inquiry; and that the treasurer be authorized to pay such cheque upon the signature of any three members present at such meeting, countersigned by the clerk."

Upon the chairman calling on him to proceed with his motion, Mr. Godson declined, alleging, as an excuse, the absence of Mr. Hughes, who would, he said, have been able to supply cogent reasons for the adoption of the resolution. The determination of the honourable member led to a long conversation, and a motion was proposed by Mr. Thos. Horn, to the effect that this board, having already contributed beyond its due proportion with other parishes to the expense of the inquiry, was not prepared to vote a further sum of money to that object. On an appeal to the solicitor, however, it was ruled that this motion was not in order, and it was withdrawn.

Mr. EDGAR HORNE then moved, and Mr. NORRIS seconded, the following motion, which was agreed to:—"That the clerk do prepare a return showing the rateable value of the property comprised within the Local Management Act; showing also the proportionate contribution of each parish and district board towards the expenses of the metropolis gas inquiry; and that a copy thereof be forwarded to each member of this board before the next meeting."

There was a notice on the *agenda* by Mr. Hughes, which, in his absence was withdrawn:—"1. That the surveyor be requested to report, for the information of the Board, what quantity of cannel gas in cubic feet, the Chartered Company must supply per annum to each public lamp, in order to give the light specified in their last contract with the board; and the consequent price per 1000 feet which the board is paying for the gas. 2. Also, the same particulars with reference to the Western Gas Company, assuming the gas supplied by that company to be of the same illuminating power as the cannel gas of the Chartered Company, which is regularly tested by the surveyor."

THE DEFUNCT MARYLEBONE CONSUMERS' GAS COMPANY.—The late secretary of this company, together with his whole family, were recently lost in the *Blervie Castle*, in which vessel they had embarked for Australia; and one of the solicitors has taken refuge from his creditors in the Court of Bankruptcy. An attempt has been made to wind up the company in the same court, under the Joint-Stock Company's Winding-up Act; but, as the books and registers have been deposited for safety from seizure by the sheriff, with a creditor, who claims a lien upon them for his account, the other creditors have hitherto been unable to take any steps towards the distribution of the assets. The outstanding debts are said considerably to exceed £1000.

"PROFESSOR FLINTOFF" AT OLDHAM.—The *Oldham Chronicle*, devotes nearly four columns to reports of two lectures on gas, delivered by "Professor Flintoff, of Glasgow." Has that university established a "chair of Impudence?"

Price Current.

CASTINGS, PER TON.

Average Weight of Cast-Iron Gas-Pipes, per Yard.

1¼ in.	2 in.	2½ in.	3 in.	4 in.	5 in.	6 in.	7 in.	8 in.	9 in.	10 in.	12 in.
16	21	28	33	51	70	89	107	126	149	177	208 lbs.

Retail Prices are 5 to 10 per cent. higher.	London.	Glasgow.	Newcastle.	Wales.	Yorkshire, Derbyshire, and Staffordsh.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Pig Iron, No. 1	4 0 0	3 2 6	3 0 0	3 5 0	3 10 0
1¼ and 2 inches Socket-Pipes	7 0 0	6 0 0	6 5 0	6 10 0	6 15 0
2½ and 3 " "	6 10 0	5 10 0	5 15 0	6 0 0	6 5 0
4 and 5 " "	6 0 0	5 0 0	5 5 0	5 10 0	5 15 0
6 in. and upwards "	5 15 0	4 15 0	5 0 0	5 5 0	5 10 0
Retorts, 1st fusion, hot blast	5 10 0	4 10 0	4 15 0	5 0 0	5 5 0
" 2nd " cold "	6 10 0	5 5 0	5 10 0	6 0 0	6 5 0
Tank Plates, ⅜ thick and above	6 0 0	5 0 0	5 5 0	5 10 0	5 10 0

WROUGHT-IRON TUBING,

Subject to 40 per cent. Discount.

	2 in.	1½ in.	1¼ in.	1 in.	¾ in.	½ in.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Patent Welded Tubes, from 2 to 12 ft., perft.	1 8	1 0	0 10	0 7	0 5	0 4¼
" " " 6 in. to 18 in., each	3 0	2 0	1 9	1 3	1 0	0 9
Connecting-Pieces, or Long Screws	3 6	2 3	2 0	1 6	1 2	0 11
Bends, Springs, and Elbows—wrought iron	3 9	2 3	1 9	1 0	0 10	0 8
Tees, wrought or cast	4 0	2 6	2 0	1 6	1 1	0 10
Crosses, wrought or cast	4 6	3 0	2 6	2 0	1 6	1 2
Iron Cocks	17 6	9 6	7 6	4 6	3 3	2 6
" with brass plug	28 0	16 0	13 0	7 0	5 6	4 6
Diminishing Sockets, Caps, Plugs, and	1 3	0 9	0 8	0 6	0 5	0 4
Plain Sockets [Nipples	1 0	0 8	0 7	0 5	0 4	0 3
Syphons, 2 quart	15 0	14 0	13 6	13 0	12 0	—

COALS, PER TON.

Newcastle.—Unscreened.		*Scotch Cannel.*	
Whitwell Primrose	6s. 3d.	Boghead, at Leith	45s. 0d.
Medomsley, Eighton Moor, and Burnhope	6 6	Kirkness, best	23 0
Pelaw	6 9	Capeldrae, 1st quality	20 0
New Pelton, Peareth, South Pelaw, Washington Hutton, and South Peareth	7 0	" 2nd "	12 6
Pelton	7 9	Lesmahago, at Glasgow	25 0
Ramsay's Newcastle Cannel	16 0	" " Leith	27 6
		Arniston	22 0
		Wemyss	20 0
		Knightswood	18 0
		Pirnie	15 0

FREIGHTS.

Coastwise—Newcastle.—Per Ton.	6s. 0d.	*Foreign.—Per Keel.*	
Chatham & Rochester	10 6	Boulogne and Calais	£8 0 0
Cork	8 0	Barcelona	23 0 0
Dover	12 6	Bordeaux	14 10 0
Dublin	10 0	Cadiz	14 0 0
Exeter Quay	8 0	Copenhagen	8 10 0
Folkestone	6 0	Dieppe	9 0 0
London (Pool)	5 0	Genoa	23 0 0
Lowestoft & Yarmouth	—	Hamburg	8 15 0
Lynn	7 0	Havre	9 5 0
Portsmouth	9 6	Leghorn	23 0 0
Plymouth	8 0	Lisbon	15 0 0
Ramsgate & Margate	7 0	Rotterdam	8 10 0
Whitstable	—	Stettin	10 0 0
Weymouth		Trieste & Venice	£24 to 25 0 0

SUNDRIES.

Best Newcastle Fire-bricks	per 1000	50s.	0d.
Cliff's Fire-bricks, at Wortley	per 1000	57	6
Ingham's Fire-bricks, at Wortley	"	55	0
Fire-clay Retorts	per foot run, 5s. 6d. to	7	0
Tough Cake Copper ... per ton	£117 0s.	Foreign Spelter ... per ton	£20 15 0
English Pig Lead ... "	22 15	English Block Tin ... "	136 0 0
Welch Bar Iron, in London "	6 15 0	Banca ... "	137 0 0
Tarred Rope Yarn	per cwt.	26s.	0d.

Advertisements.

THE STANDARD CUBIC FOOT.

E. W. LADD and CO. are now prepared to supply Copies of the Standard Cubic Foot constructed by them for the Office of Her Majesty's Exchequer.

E. W. LADD AND CO.,

Standard Weight and Measure Manufacturers, and Hydrometer, &c., Makers to the Board of Inland Revenue,

1, OLD JEWRY, LONDON.

TRUSS'S PATENT ELASTIC PIPE-JOINT,

FOR GAS, WATER, AND STEAM.

Is the only PERFECT joint that has ever been constructed, and supplies the long-felt desideratum, by allowing for the expansion and contraction of metals, and for oscillation and deflection, without impairing the joint. Gas Companies will effect an incalculable saving in adopting it, as compared with the present imperfect mode of jointing.

Drawings, Estimates, and every particular, furnished on application to

THOMAS SEAVILLE TRUSS, C.E., 53, GRACECHURCH STREET, LONDON, E.C.

SALE OF GAS ACT.—

At a Meeting of the GAS-METER MANUFACTURERS of England and Scotland, held at Radley's Hotel, New Bridge Street, Blackfriars, London, on Monday, March 5, 1860, at which were present—

Messrs. John Beverley and Son, Leeds.
Messrs. C. Botten and Son, London.
Mr. W. Cowan, Edinburgh.
Messrs. Croll, Rait, and Co., London.
Messrs. Crosley and Co., London.
Messrs. N. Defries and Sons, London.
Mr. Thomas Glover, London.
Mr. Harthey (A. Wright), London.
Messrs. D. Hulett and Co., London.
Mr. W. Jones, London.
Messrs. Laidlaw and Son, Glasgow.
Mr. James Meacock, London.
Messrs. Milne and Son, Edinburgh.
Messrs. Paddon and Ford, London.
Messrs. W. Parkinson and Co., London.
Mr. W. Smith, London.
Messrs. J. Squire and Co., London.
Messrs. Stevens and Son, London.
Mr. William Sugg, London.
Mr. John Vickary, Exeter.
Messrs. West and Gregson, Oldham.

Mr. ROBERT BEVERLEY, of Leeds, was appointed chairman, and the following resolutions were passed unanimously:—

1. Upon the motion of Mr. Glover, seconded by Mr. Defries, jun.: "That the delay which has taken place in providing the models of gasholders with proper balances, indices, and apparatus for testing the measurement and registration of gas-meters, in pursuance of the 3rd section of the Act for Regulating Measures used in Sales of Gas, and the uncertainty which prevails as to the means to be adopted for carrying that Act into effect, are highly prejudicial to the interests of the manufacturers of gas-meters, and ought to be forthwith put an end to."

2. Upon the motion of Mr. Rait, seconded by Mr. Ford: "That it is not possible to test meters in the manner directed in the 13th section of the Act, by the use of any of the instruments now deposited in the office of the Comptroller-General of the Exchequer."

3. Upon the motion of Mr. W. Crosley, seconded by Mr. Vickary: "That the report of the Astronomer-Royal to the Treasury, dated the 11th of February, 1860, on the instrumental equipments of the Exchequer Office of Weights and Measures, as regards the instruments therein deposited in pursuance of the Act, is unsatisfactory, and contrary to its clearly expressed meaning, inasmuch as the instrument which he therein calls a gas-measurer, is, in the opinion of this meeting, the gasholder containing multiples or decimals of the standard cubic foot named in the 3rd section of the Act, and such an instrument is one of the models which the Treasury is directed to provide and stamp."

4. Upon the motion of Mr. Defries, seconded by Mr. John Milne: "That a committee be appointed, consisting of nine members, viz.:—

The Chairman (Mr. Robert Beverley, of Leeds);
Mr. John Milne, of Edinburgh;
Mr. T. Glover, of London;
Mr. W. Smith, of London;
Mr. W. Crosley, of London;
Mr. C. R. Mead (for J. Squire and Co.), of London;
Mr. Defries, of London;
Mr. Hulett, of London; and
Mr. Vickary, of Exeter;

to draw up a memorial embodying these resolutions, and to present the same to the Treasury, and report the result to an adjourned meeting; and that this committee do meet immediately after the adjournment of this meeting."

5. Upon the motion of Mr. Defries, seconded by Mr. Hulett: "That the foregoing resolutions be advertised in the *Times*, *Daily News*, *Daily Telegraph*, and *Standard* newspapers, and that a subscription be opened for defraying the expenses of the committee in furthering the objects of this meeting, and that the chairman be appointed treasurer thereof."

ROBERT BEVERLEY, Chairman.

TENDERS FOR AMMONIACAL LIQUOR.

THE Directors of the Great Central

GAS CONSUMERS' COMPANY are prepared to receive Tenders for the AMMONIACAL LIQUOR made at their Works, Bow Common, for One Year from the 1st of May next.

Tenders to be addressed to these Offices, up to the 22nd of March.

R. M. MASSEY, Secretary.

28, Coleman Street, E.C., March 8, 1860.

METROPOLITAN BOARD OF WORKS.

PERCHLORIDE OF IRON.

EXTENSION of TIME for receiving

TENDERS for the supply of PERCHLORIDE of IRON.

To CHEMISTS, MANUFACTURERS of DEODORIZING AGENTS, and others. The Metropolitan Board of Works hereby give notice, that they have EXTENDED the TIME for SENDING IN TENDERS for the SUPPLY of PERCHLORIDE of IRON for deodorizing purposes, from the 29th of March inst., to the 12th of April next.

The Specification may be inspected, and form of Tender and further particulars obtained at the offices of the Board, No. 1, Greek Street, Soho, between the hours of Nine a.m. and Four p.m.

Sealed Tenders, addressed to the Metropolitan Board of Works, endorsed "Tender for the Supply of Perchloride of Iron," must be delivered at their office, No. 1, Greek Street, Soho, before Four o'clock on Thursday the 12th April next, and no Tender will be received after that hour.

The Board do not bind themselves to accept the lowest or any Tender, and the Tender must contain the names of two responsible sureties who are willing to be bound with the contractor, jointly and severally for the due performance of the Contract.

The Board will MEET at the Council Chamber, Guildhall, in the city of London, on Friday, the 13th of April next, at Twelve o'clock at noon precisely, and will then be prepared to open the Tenders.

JOHN POLLARD, Clerk of the Board.

No. 1, Greek Street, Soho, March 7, 1860.

SALE OF GAS ACT.—

At a Meeting of MANUFACTURERS of GAS-METERS, held at Radley's Hotel, New Bridge Street, Blackfriars, on Monday, March 12, 1860,—Mr. ROBERT BEVERLEY, of Leeds, in the chair,—the Honorary Secretary (Mr. W. Crosley) read a report of the proceedings of the Deputation to the Secretary of the Treasury on the 9th instant, and of the Deputation to the President of the Board of Trade on the 10th instant. The following resolutions were then unanimously agreed to:—

On the motion of Mr. Rait, seconded by Mr. W. Sugg: "That the report of the committee just read be received and adopted."

Moved by Mr. Hartley, seconded by Mr. C. Parkinson: "That the proposed petitions to both Houses of Parliament be signed by the chairman on behalf of the general meeting."

Moved by Mr. W. Sugg, seconded by Mr. Boulton: "That each individual member of this meeting shall use his best endeavours to bring the knowledge of the facts of the position of the Act to the Members of both Houses of Parliament, showing that it has not been complied with by the Treasury."

Moved by Mr. Meacock, seconded by Mr. Hartley: "That a subscription of £3 3s. each be entered into forthwith and paid to the Chairman."

Moved by Mr. West, seconded by Mr. Defries: "That the thanks of this meeting be given to those Members of Parliament who accompanied the deputations, and introduced them to the respective authorities at the Treasury and the Board of Trade, and supported their objects—viz.: H. B. Sheridan, G. S. Beacroft, and Edward Baines, Esqs."

Moved by Mr. W. Sugg, seconded by Mr. Mead: "That the members of this meeting resolve themselves into a Gas-Meter Manufacturers' Association, for the purpose of advancing the interests of the trade—all persons so agreed to give in their names to the Chairman before leaving."

Moved by Mr. Defries, seconded by Mr. Hulett: "That an advertisement be inserted in the JOURNAL OF GAS LIGHTING, inviting all Gas-Meter Manufacturers in Great Britain, who are not present at this meeting, to co-operate with us in the present movement and to join our association."

Moved by Mr. Smith, seconded by Mr. Mead: "That the thanks of this meeting be given to Mr. Marriott, for his valuable and kind services in his professional capacity of Parliamentary agent."

Moved by Mr. Hulett, seconded by Mr. Defries: "That the cordial thanks of the meeting be presented to the chairman for his indefatigable exertions in reference to this movement."

Moved by Mr. Crosley, seconded by Mr. Hulett: "That the proceedings of this meeting be advertised in the JOURNAL OF GASLIGHTING."

Moved by Mr. West, seconded by Mr. Bolton: "That the present committee be empowered to take such steps as they may deem expedient, parliamentary and others, and to incur such liabilities as they may deem requisite to a termination."

Moved by Mr. West, seconded by Mr. Meacock: "That information of the results of the operations of the committee be forwarded to the members of the association by circular as often as the committee may think expedient."

Moved by Mr. West, seconded by Mr. Meacock: "That five members of the committee shall form a quorum."

ROBERT BEVERLEY, Chairman.

TO GAS-METER MANUFACTURERS.

AT a Meeting of Gas-Meter Manu-

FACTURERS convened at Radley's Hotel, New Bridge Street, Blackfriars, London, on Monday, the 12th inst., it was resolved by the Gentlemen present, that they would form themselves into a GAS-METER MANUFACTURERS' ASSOCIATION, for the purpose of advancing the interests of the trade, and advertise the same in the JOURNAL OF GAS LIGHTING, inviting the co-operation of their brethren.

All communications to be addressed to Mr. W. B. KING, 11, Bolt Court, Fleet Street, LONDON, E.C.

EIGHTON MOOR GAS COALS.—

Parties wishing to be supplied with these first-class Gas Coals will please to apply to Mr. MATTHEW NESBIT, EIGHTON MOOR OFFICE, NEWCASTLE-UPON-TYNE. These coals are well known as among the richest in gas, and working the roundest on the River Tyne. They are extensively used by metropolitan gas works.

JAMES NEWTON,

(Established 1820,)

FIRE-BRICK AND TILE MERCHANT,

Wholesale and for Exportation,

FALCON DOCK, 78 AND 79, BANKSIDE, SOUTHWARK, LONDON.

DEPÔT for STOURBRIDGE AND NEWCASTLE FIRE-BRICKS, LUMPS, TILES, and CLAY, and every Article suitable for

GAS AND WATER WORKS.

SOUTH METROPOLITAN GAS-

LIGHT AND COKE COMPANY.

NOTICE is hereby given, that an ORDINARY MEETING of the PROPRIETORS of this Company will be held at the London Tavern on WEDNESDAY, the 4th day of April next, at Two o'clock precisely, to receive the Directors' Report and the Accounts of the Company for the half year, ended December 31st last, to declare a Dividend for the same period, and to elect one Director and one Auditor in the place of Joseph L. Heathorn, Esq., Director, and George Coxhead, Esq., Auditor, who retire from office agreeably to the Act of Incorporation; but being eligible, offer themselves for re-election.

Any Proprietor, holding 40 shares, intending to become a Candidate for either of these offices, must give notice in writing, at the office of the Company, at least Fourteen days previously to the day of Election.

By order of the Directors.

THOMAS LIVESEY, Secretary.

Old Kent Road, March 12, 1860.

WEST and GREGSON, Gas-Meter

MANUFACTURERS, &c.

UNION STREET, OLDHAM.

Station and Experimental Meters, Gas Pressure Registers, Ganges, Experimental Gasholders, Governors, Slide Valves, &c. &c.

W. and G. would respectfully call the attention of Gas Engineers and Managers to their Station-meters, having made and erected the largest in use at the present time, two of which may be seen at the Stockport and Liverpool Gas Works, on application to the respective Engineers.

WALTER MABON, Engineer,

ARDWICK IRON WORKS, FAIRFIELD STREET

MANCHESTER,

Manufacturer of

IRON TANKS for Gasholders, Railway Stations, &c.

GASHOLDERS.—Extensive premises at Gorton, solely for the manufacture of Gasholders, and other heavy Wrought-Iron Structures.

GAS APPARATUS.—W. M. has an extensive assortment of patterns for Purifiers from 4 feet to 15 feet square, also round ones from 4 feet to 10 feet diameter; Scrubbers, Condensers, Washers, Columns, Girders, and Tripod Patterns, suitable for Gasholders, from 10 feet to 150 feet diameter, either Single-lift or Telescope. Contractor for Gas Works of any Magnitude. Designs, Specifications, and Estimates furnished.

WROUGHT and CAST IRON ROOFS for Railway Stations, Gas Works, Warehouses, and Sheds, prepared for Slates or for Corrugated Iron.

IRON HOUSES, either for Dwellings, Manufactories, or Public Buildings.

PIPES and VALVES, for Gas and Water, from 2 inches to 48 inches bore.

WHITEHOUSE and CO., Boiler and GASHOLDER MAKERS,

GLOBE PATENT TUBE WORKS,

WEDNESBURY,

Beg to draw the attention of Engineers and Managers of Gas Works to the superior quality of the Article they manufacture, both in respect of the iron employed, and the perfect manner in which it is welded; in proof of which they can refer to the testimonials of the most eminent Gas Engineers, and the experience of the principal of the large Gas Companies of the kingdom.

Orders promptly executed.

TO Mr. BENJAMIN WHITEHOUSE,

GASHOLDER MAKER,

WESTBROMWICH, NEAR BIRMINGHAM.

Sir,—I feel great pleasure in expressing my satisfaction at the manner in which you discharged your duties as CONTRACTOR for the TELESCOPIC GASHOLDER, 150 feet diameter and 60 feet deep, erected at this Company's Nine Elm Station in 1857. From that period to the present I have closely watched its working, and have never found the least defect either in workmanship or material.

During the recent heavy gales the Gasholder, although containing upwards of 1,000,000 cubic feet of Gas, showed no perceptible indications of its influence, but worked as freely and easily as usual.

RICHARD JONES,

Engineer to the London Gaslight Company.

Vauxhall, London, Nov. 9, 1859.

FLEXIBLE GAS TUBING,
VULCANIZED INDIARUBBER HOSE-PIPES,
WASHERS FOR STEAM-JOINTS, &c.

JAMES LYNE HANCOCK begs to

inform the trade he has considerably improved the manufacture of his FLEXIBLE TUBING, both PLAIN and GLAZED. Made all sizes in 60 feet lengths.

INDIARUBBER GAS BAGS, fitted complete with Stop-Cocks and Tubes.

All orders to be addressed to JAMES LYNE HANCOCK, Vulcanized Indiarubber Works, Goswell Road, (opposite Spencer Street) LONDON (E.C.).

TO GAS COMPANIES.

WANTED by the advertiser a

situation as MANAGER of Gas-Works. Is 33 years of age, and married, and has had 15 years' experience in different Gas-Works.

Understands the setting of Iron and Clay Retorts, and the working of them; Taking Consumers' Meters. Returns from Stokers, Main and Service-Laying and everything relative to the Manufacture and Distribution of Gas and keeping of the daily accounts at the Works.

Can forward, on application, first-class Testimonials, and Security if required.

Address, C. F. HUGHES, No. 31, Brunswick Street, WOLVERHAMPTON.

TO GASHOLDER MAKERS AND IRON FOUNDERS.

THE Directors of the Newmarket

GAS COMPANY are prepared to receive Tenders accompanied with Plans and Specifications, for the erection of a CAST-IRON TANK and TELESCOPE GASHOLDER, with Columns, Girders, &c., complete. The Tank not to exceed 24 feet diameter, and the Gasholder to contain not less than 10,000 cubic feet.

The Specifications to include the erection of the Tank and Holder at the Works in Newmarket, with all necessary Pipes to connect the Holder with the present Works.

The Directors will receive separate Tenders, one for the Tank, fixed complete, and the other for the Gasholder, with the Columns, Girders, &c., also fixed complete.

The Tenders, &c., are to be delivered to the MANAGER at his office, Newmarket, on or before the 19th day of March next, endorsed "Tenders for Gasholder;" but the Directors do not bind themselves to accept the lowest or any Tender.

Further information may be obtained of the Manager.

Newmarket, Feb. 25, 1860.

TO GAS & WATER COMPANIES, ENGINEERS AND FITTERS.

GARSIDE'S Registered Tube-Vice holds all sizes of Wrought-Iron and Brass Tubes with the greatest firmness and least possible pressure; consequently it is not so liable to split or damage the Tubes as the ordinary Vice, and considerably facilitates the Workman, who may do almost double the quantity of work. Also,

GARSIDE'S IMPROVED MAIN-DRILLING CLIPS, for Drilling Holes for Service-Pipes. With this instrument the perforation of Pipes for the attachment of smaller Tubes can be effected with great ease and precision. Likewise,

HEAP'S REGISTERED GAS TONGS, most highly approved of as vastly superior to those in present use. Stocks, Taps, and Dies, together with all tools connected with Gas Engineering.

For Drawings, Testimonials, and prices, apply to the Maker, S. GARSIDE, Stamford St., ASHTON-UNDER-LYNE.

JOHN ROGERSON and CO.,
NEWCASTLE-ON-TYNE & MIDDLESBRO'-ON-TEES.

Wrought and Cast Iron Pipes, Cast-Iron Retorts, and all kinds of Foundry Work necessary for Gas-Works. Fire-Bricks and Clay Retorts. Gas Coals of every description. Pig, Bar, and Plate Iron.

LONDON HOUSE:
12, ROYAL EXCHANGE BUILDINGS.

ROBERT MACLAREN and CO.,
EGLINTON FOUNDRY, GLASGOW,
Manufacturers of all sizes of Cast-Iron Main Pipes, by an improved Patent. General Ironfounders, Gas Engineers, and Wrought-Iron Tube Makers.

GAS, WATER, MINING, AND GENERAL ENGINEERING.

MR. PRESTON LUMB having changed his Offices to 16, NORTHUMBERLAND STREET, STRAND, W.C., feels it incumbent upon him to announce to his clients and others that he may be consulted (from 10 to 5) in every branch of Engineering. His twenty-five years' experience and success, *especially in the construction and leasing of Gas-Works*, has enabled him to increase his hitherto extensive and efficient staff, so that Boards of Directors may confidently rely upon his prompt attention. He has also the command of a large amount of Capital for Engineering enterprise.

London, 16, Northumberland Street,
Strand, W.C., Jan., 1860.

M. SHEEN, Gas and Railway Lantern Maker, 90½, Holborn Hill, begs to inform Managers of Gas-Works, &c., that she continues to contract and supply Lanterns on reasonable terms, and keep them in repair by the year.

JOSEPH WILLCOCK
(late BARLOW and CO.),
Mechanical and Architectural Draftsman, Designer, Serveyor, an Lithographer to Gas Engineers and Gas Apparatus Manufacturers, formerly Superintending Engineer at the largest Gas Apparatus Manufactory on the Continent.

Patent and Designs Office, 89, Chancery Lane, LONDON, W.C.

CHARLES BOTTEN and SON,
ENGINEERS & METER-MAKERS,
CRAWFORD PASSAGE, RAY STREET,
CLERKENWELL, LONDON (E. C.).
Manufacturers of Station and Patent Protector Consumers' Meters, Patent Slide-Valves, Gas-Fittings, Pipes, &c.

Also, High-pressure Cocks, Hydrants, Closets, and all Water-Fittings.

WILLIAM STEPHENSON & SONS,
THROCKLEY,
NEWCASTLE-ON-TYNE,
MANUFACTURERS OF EVERY DESCRIPTION OF
FIRE BRICKS, CLAY RETORTS, LUMPS, TILES,
&c. &c.

LONDON OFFICES:
76, KING WILLIAM STREET, CITY.

A large stock of Fire-Clay Goods always on hand in London, at the lowest wharf prices, at Messrs. CHRISTIE & Co.'s Wharf, 64, Bankside, SOUTHWARK.

GAS ENGINEERING AND GENERAL IRON-WORKS COMPANY
(LIMITED).

THIS Company is formed for the purpose of erecting Gas-Works, Roofs, Boilers, Engines, and Iron-Work of every description, for London, the Provinces, and Continental Cities. The Directors, have purchased an old established concern, in full work, possessing ample machinery, and every convenience for carrying on a large business, and have secured as practical Manager a gentleman who has been engaged for upwards of Thirty years in erecting Gas-Works in various parts of the Kingdom.

The advantages accruing to the shareholders in the undertaking are fully detailed in the prospectus. It is neither a new or speculative project; but, by the addition of further capital, the Company are extending a sound and healthy business, which has yielded for years past more than 20 per cent. on the capital invested.

Prospectuses, with full particulars, and forms of application for the remaining Shares, can be obtained at the Offices of the Company, 11, Pancras Lane, Queen Street, E.C.

The Company is prepared to make Plans and Estimates for any of the above work, on application.

TO GAS COMPANIES.

STOKER'S GLOVES,
11s. per Dozen.
S. CARPENTER, 3, BOW COMMON.

NOW READY,

VOL. VIII. of the JOURNAL of GAS LIGHTING, WATER SUPPLY, and SANITARY IMPROVEMENT, for 1859, price 21s., bound in cloth and lettered. A few copies of Vols. II., III., IV., V., VI., and VII. are still on sale.
W. B. KING, 11, Bolt Court, Fleet Street.

GAS Apparatus of every kind, and their action explained and thoroughly tested as to the practicability of HEATING BATHS, Conservatories, Halls, Public Buildings, &c., for all kinds of Cooking and Domestic Purposes, at PHILLIPS'S MANUFACTORY, 55, Skinner Street, SNOW HILL, E.C. (the Original Inventor and Patentee), Gas-Fitter by appointment to Her Majesty's Government and many of the Nobility.

N.B.—An assortment of Hughes's Patent Safety Atlas Chandeliers, and all kinds of Gas-fittings of a superior style and workmanship.

GAS APPARATUS.

TO be disposed of cheap, the under- mentioned Apparatus and Castings, viz:—
2 Dry-Lime Purifiers, complete, with Covers, Sieves, &c.;
8 Lengths of Hydraulic Main, with Stand, Arch, and Dip-Pipes;
30 Circular Retort Mouth-Pieces, and 60 Lids;
8 Furnace Doors and Frames;
A Governor with Cast-Iron Tanks, several Tar Cisterns, Hydraulic Cup Valves, and a large quantity of old Castings.

Particulars as to size, price, &c., will be forwarded on application to Mr. J. L. COCKER, Gas-Works, Merthyr Tydvil, GLAMORGANSHIRE.

COUNTY and GENERAL GAS CONSUMERS' COMPANY (LIMITED).

Notice is hereby given, that the DIVIDEND on the paid-up capital of this Company, for the half-year ending 31st December, 1859, at the rate of 5 per cent. per annum, will be PAYABLE on and after the 31st of March instant, between the hours of 12 and 2 daily, at the offices of the Company, 76, King William Street, E.C.

By order, R. S. PARKER, Secretary.
London, March 2, 1860.

TO GAS APPARATUS MAKERS AND OTHERS.

PERSONS desirous of tendering for a new set of PURIFIERS for the Portsea Island Gaslight Company, may inspect the Plans and Specification on application to Mr. EVANS, of the Chartered Gas-Works, Horseferry Road, WESTMINSTER.

The Tenders to be delivered at the Company's office, Portsea, on or before the 28th instant.

The Directors do not bind themselves to accept the lowest or any Tender.

By order of the Directors,
JAMES F. ABSALOM, Clerk to the Company.
Gas Office, Portsea, March 1, 1860.

CAUTION.

TO GAS-METER MANUFACTURERS AND OTHERS.

THE Undersigned hereby caution Meter Manufacturers and others against infringing the exclusive right of the Undersigned to the use of the Screw Adjustment for regulating the Height of the Overflow-Pipes in Wet Gas-Meters, as described in the Specification of the Letters Patent granted to Crosley and Goldsmith on the 19th of April, 1856; as well as against infringing any other portions of that or any other Patent of the said William Crosley; and

NOTICE is further given, that all Infringers of the said Inventions, or any portions of them, will be proceeded against. CROSLEY & CO.,
103, SOUTHWARK BRIDGE ROAD,
LONDON, Aug. 29, 1859.

Just Published, Price 1s.; by Post, 1s. 1d.,

A LETTER to the Secretary of STATE for the HOME DEPARTMENT on the SUPPLY of GAS in the METROPOLIS.
By THOMAS G. BARLOW, C.E.
W. B. KING, 11, Bolt Court, Fleet Street, LONDON.

ADDISON POTTER,
WILLINGTON QUAY,
NEAR NEWCASTLE-UPON-TYNE,
Manufacturer of Clay Retorts, Fire Bricks, and every description of Fire Clay Goods.

GEORGE ANDERSON, Gas and
CONSULTING ENGINEER,
104, LEADENHALL STREET, LONDON (E.C.).
DIRECT-ACTING GAS-EXHAUSTERS,
supplied either with or without Steam-Engines and Boilers.

FOUR-WAY DIAPHRAGM VALVES,
one of which answers the purpose of THREE ordinary Valves, as applied to Purifiers, or in shutting off and passing Station-Meters, Governors, or other apparatus, while the Connecting-Pipes are also much simplified.

RETORT SETTINGS,
designed to be heated by Tar alone, and with a total absence of Smoke.

Illustrated circulars, giving references and every information, may be obtained on application as above.

ALFRED PENNY, Engineer,
WENLOCK IRON WORKS,
WHARF ROAD, CITY ROAD, LONDON.
Mr. PENNY begs to inform Gas and Water Companies that he undertakes the erection of new, or the alteration of existing, works; and that he may be consulted generally on all matters connected with gas and water supply. He is also prepared to supply best Cold-blast Retorts, Socket-Pipes, and Connections, Iron Borings, &c. &c., and all the necessary Castings used in Gas and Water-Works.
*** Country orders executed with care and despatch.

CAST-IRON Retorts, Socket Pipes, with Syphons and all requisite Connexions, Lamp Columns, Wrought Iron Tubing, Valves, Street Lamps, Sight Holes, Furnace Doors, Ash Pans, Charging and Coke Shovels, Iron Pails and Coke Barrows, Cross Bars, Fire Pots, Pumps, Iron Borings.

PURIFIERS, CONDENSERS, and SCRUBBERS erected complete, or the materials supplied; with every description of goods in use by Gas-Works, in stock, on wholesale prices, at

Mr. LYNCH WHITE'S,
Old Barge Iron Wharf, Upper Ground Street,
LONDON.

CANNEL and COAL of the best de- scriptions for making GAS and COKE.
(As per Analyses.)
GAS CANNEL, 17s., 15s. 6d., and 14s. per ton.
GAS COAL, 11s. 6d., 9s. 6d., and 8s. 6d. per ton.
STEAM COAL, 10s., 9s. 6d., and 9s. per ton.
All free on board Vessels in Liverpool.
Handpicked Cannel and Coal about 10 per cent. additional. Concession in prices made for large quantities.

GAS APPARATUS of all descriptions, and on the most approved principles; also Purifying and other materials supplied.

ANALYSES, PLANS, and ESTIMATES, and other information required, and the highest references furnished on application.

CONTRACTS for Materials and Works entered into. No charge made for Superintending Shipments, Preparing Bills of Lading, or passing Entries.

EMANUEL TURNER and CO.,
EXPORT OFFICES:
34, CASTLE STREET, LIVERPOOL.

PADDON AND FORD,
GAS-METER AND APPARATUS WORKS,
GRAY'S INN ROAD, LONDON.
MANUFACTURERS OF WET AND DRY GAS-METERS, STATION-METERS, GOVERNORS, EXPERIMENTAL APPARATUS, &c. &c.

Sole Manufacturers of Sanders's Patent Compensator for maintaining a correct Water-Level in the Meter without impeding its legitimate action.

All Meters manufactured by P. and F. are guaranteed to be in strict conformity with Lord Redesdale's Sale of Gas Act.

A large number of **STATION-METERS,** up to 80,000 feet per hour (being by far the largest in use), and **GOVERNORS** for **MAINS**, up to 24 inches, have been constructed by Paddon and Ford. These Meters and Governors possess peculiar advantages as regards strength and freedom of action. The Meters are warranted to offer less resistance than Meters generally.

Manufacturers also of **PADDON'S PATENT STREET-LAMP REGULATORS,** for insuring any required consumption. These Regulators are in general and increasing use, and references can be given to Gas Companies who use them for every Lamp.

Contractors for the erection or alteration of Gas-Works, and every description of apparatus required in Gas-Works supplied.

WOLVERHAMPTON RETORT WORKS.
ESTABLISHED **1840.**
JOHN EUNSON AND SON,
GAS ENGINEERS, AND MANUFACTURERS OF CLAY RETORTS,
AND FIRE GOODS IN GENERAL,
WOLVERHAMPTON.
Retort Mouthpieces, Bolts, Nuts, and every description of Wrought-Iron Work.

BOULTON'S PATENT DRY GAS-METERS,

Of which upwards of 24,000 are at present in use, having gained for themselves an unparalleled patronage from all the principal Gas Companies and Consumers, on account of their unerring registration and the superior workmanship and materials used in their construction, enables the Patentee to sell them now at competitive prices with those of other makers.

Every description of Improved Wet or Patent Dry Meters and Gas Apparatus manufactured by

JOSEPH BOULTON,

28, BAGNIGGE WELLS ROAD, CLERKENWELL.

All Meters warranted to comply with the requirements of Lord Redesdale's "Sale of Gas Act.'

BENT AND SON,

283, BELL-BARN ROAD, BIRMINGHAM,

(ESTABLISHED 1830,)

Manufacturers of

J. C. BENT'S PATENT COMPENSATING GAS-METER;

Also of

ALLAN'S PATENT COMPENSATOR,

Both of which are warranted to meet the requirements of the SALE OF GAS ACT.

Station-Meters. Street Lamps of all kinds, plain and ornamental.

ESSON'S PATENT
COMPENSATING GAS-METER

Is guaranteed correct within the meaning of the "Sale of Gas Act." Manufactured only by WILLIAM COWAN, Buccleuch Street Works, EDINBURGH; and Strutt Street, MANCHESTER.—Established 1827.

FLOATS AND MECHANICAL VALVES ENTIRELY DISPENSED WITH.

KAY'S PATENT HYDRAULIC VALVE GAS-METER

Meets all the requirements of the Sale of Gas Act.

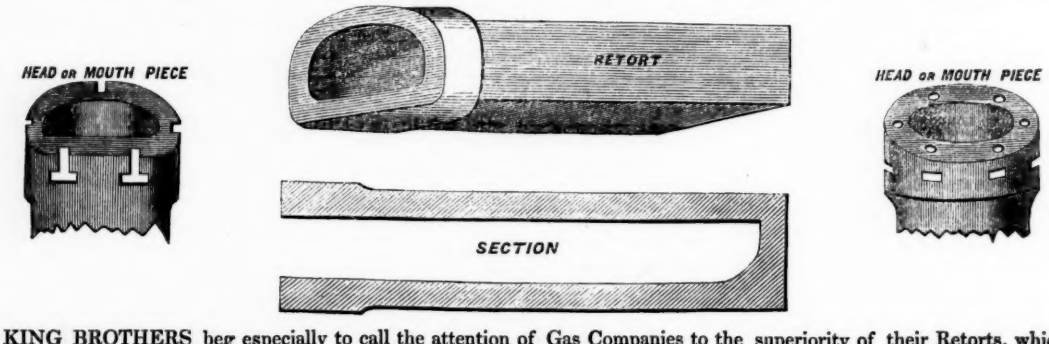
The only cheap means of bringing ordinary Meters within the limits of the Act is to affix to them the Hydraulic Valve, which can be done at a small cost, for which purpose Gas Companies can obtain a license from the Sole Manufacturer and Licensee,

WILLIAM COWAN,

Buccleuch Street Works, EDINBURGH; and Strutt Street, MANCHESTER.

KING BROTHERS,

STOURBRIDGE FIRE-BRICK AND RETORT WORKS,



KING BROTHERS beg especially to call the attention of Gas Companies to the superiority of their Retorts, which are made from the celebrated STOURBRIDGE FIRE-CLAY. Mr. King has patented a Kiln for Burning Retorts, by which Patent all Cold Air is excluded from the Kiln while burning, thus rendering them

FREE FROM CRACKS AND CORRECT IN FORM.

By great care in Manufacturing, combined with the advantages in burning, a VERY SMOOTH SURFACE is obtained, rendering them less liable to carbonize.

RETORT OVENS, FIRE-BRICKS, GUARDS, SADDLES, RABBITTED BURS, FLUES, AND QUARRIES, ARE ALL MANUFACTURED OF THE SAME QUALITY OF CLAY.

Every Retort and Brick is branded "King Brothers, Stourbridge."

CROSLEY & GOLDSMITH'S

PATENT SELF-ADJUSTING & COMPENSATING GAS-METERS

CANNOT BE OVER OR UNDERCHARGED WITH WATER,

and they consequently register the quantity of Gas consumed with greater accuracy than Meters in which the Water-Line is variable.

MANUFACTURED BY

CROSLEY & CO.,

GAS-METER MANUFACTURERS,

103, SOUTHWARK BRIDGE ROAD, LONDON.

N.B. The Patent Self-Adjusting and Compensating Apparatus may be applied to the ordinary Meter.

Manufacturers of LOWE'S PATENT MOTIVE-POWER METER, for situations where there is an inadequacy of pressure to supply the special requirements of certain consumers in low grounds during the day or night.

Also, Manufacturers of EXPERIMENT METERS, GASHOLDERS, GOVERNORS, MINUTE-CLOCKS, PHOTOMETERS, &c. &c., similar to those used by Mr. King, of Liverpool.

C. and Co. are the only house in the trade which has for years manufactured Meters according to the standard measure set forth in the 2nd Section of the "Sale of Gas Act," and which also comply with the rules laid down in the Section for testing meters. Purchasers of C. and Co.'s Meters may therefore be secured against any additional expenses being incurred in order to adapt their Meters to the requirements of the new Act.

WILLIAM PARKINSON AND CO.,

(SUCCESSORS TO THE LATE SAMUEL CROSLEY,)

COTTAGE LANE, CITY ROAD, LONDON, E.C.,

PATENTEES AND MANUFACTURERS OF

GAS-METERS, GOVERNORS, AND OTHER APPARATUS;

ALSO,

METERS FOR MEASURING WATER, &c., &c.

IMPROVED LOW-SPOUTED GAS-METERS,

Which completely meet the requirements of Lord Redesdale's Sale of Gas Act, and are as simple in their construction, satisfactory in working, and as low in price as the well-known Meters which have been made by W. P. and Co., and their predecessor, Mr. Samuel Crosley, during the last forty years, and of which there are about 300,000 now in use.

STATION-METERS AND GOVERNORS

Of all Sizes, of the best Construction, Materials, and Workmanship, supplied on he shortest notice.

There are about 300 Station-Meters at work of their manufacture, of sizes varying from 750 to 60,000 cubic feet per hour, of which the following are some of the principal ones, recently supplied by them to London Gas Companies, viz. :—

2	for	60,000	cubic feet per hour each	to the Chartered Gaslight and Coke Company, Westminster;
1	,,	40,000	,, ,,	Chartered Gaslight and Coke Company, Brick Lane;
2	,,	60,000	,, ,,	London Gaslight Company, Vauxhall;
1	,,	60,000	,, ,,	Commercial Gas Company, Stepney;
1	,,	40,000	,, ,,	Equitable Gas Company, Pimlico;
1	,,	40,000	,, ,,	Phœnix Gaslight Company, Greenwich,

&c. &c. &c.

And they have also supplied large Station-Meters to the Gas Companies at Birmingham, Nottingham, Sheffield, Southampton, Leeds, Newport, Glasgow, Manchester, Dublin, Cork, and all the principal towns in the United Kingdom, as well as many on the Continent, &c., &c.

Their Station Gas-Governors have been adopted by most of the above-named Companies, and have given universal satisfaction.

PRESSURE REGISTERS, EXPERIMENTAL METERS, PHOTOMETERS,

Minute Clocks, Consumers' Gas-Governors, Pressure-Gauges,

STANDARD EXPERIMENTAL GASHOLDERS FOR PROVING METERS, &c.

GEORGE LOWE'S PATENT NAPHTHA BOXES AND MOTIVE-POWER METERS,

WITH MACHINERY FOR WEIGHTS TO ASSIST THE SUPPLY OF GAS WHERE THE PRESSURE IS LOW.

SPECIFIC GRAVITY APPARATUS, RAIN GAUGES, &c.

JAMES MEACOCK,

PATENT DRY AND WET GAS-METER MANUFACTURER,

7, SNOW HILL, AND 16, WEST STREET, LONDON.

ESTABLISHED 1836.

J. M. invites attention to his Improvements in EXPERIMENTAL WET GAS-METERS, by which he renders impossible any Leakage from the Stuffing-Box.

These METERS are GUARANTEED to meet all the REQUIREMENTS of the SALE OF GAS ACT.

GOVERNORS, STATION-METERS. PHOTOMETERS,

EXPERIMENTAL & TESTING GASHOLDERS, HIGH-PRESSURE GAUGES,

AND ALL APPARATUS IN USE AT THE GAS MANUFACTORY.

JAMES OAKES and CO.,

ALFRETON IRON WORKS, DERBYSHIRE,

AND

WENLOCK IRON WHARF, 20, WHARF ROAD, CITY ROAD, LONDON,

Beg to inform Gas and Water Companies and the public, that they keep in stock in London all the CASTINGS in general use in Gas and Water Works, including best cold-blast Iron Retorts, Socket and Flange Pipes of all sizes, Bends, Branches, Syphons, Lamp Columns of various patterns, &c.

N.B.—Orders for Cast-iron Tanks, Girders, Columns, Cylinders, and all irregular castings, will have immediate attention.

CHARLES HORSLEY, Agent.

C. H. is prepared to carry out the warming and ventilation of public buildings, &c.; also civil engineering in general.

F. & C. OSLER,

45, OXFORD STREET, LONDON;

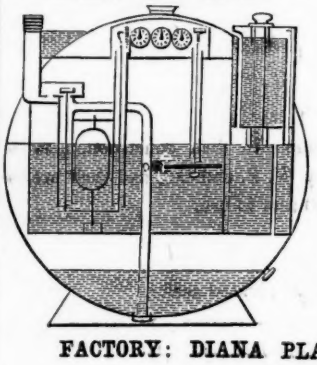
Manufactory—Broad Street, Birmingham—Established 1807,

MANUFACTURERS OF GLASS CHANDELIERS, GLASS LUSTRES, TABLE GLASS, &c. &c.

ELEGANT CRYSTAL GLASS CHANDELIERS, for GAS, from £4 upwards (Made from "REGISTERED" DESIGNS), with GLASS BRANCHES, &c.; suitable for DRAWING-ROOMS and BALL-ROOMS. The more extensive use of GAS in private dwellings has induced Messrs. OSLER to direct their particular attention to the manufacture of this class of articles—which, with a view to their general adoption, are offered at very moderate prices. Purchasers can select from a great variety of patterns, to which additions are being constantly made.

THEATRES, CONCERT, ASSEMBLY, AND BALL ROOMS LIGHTED BY ESTIMATE ON THE LOWEST TERMS.

PATENT WET METER.



N. DEFRIES,

CONSULTING GAS ENGINEER,

Inventor and Patentee

OF

WET GAS-METERS,

WITH SELF-ADJUSTING WATER-LINE;

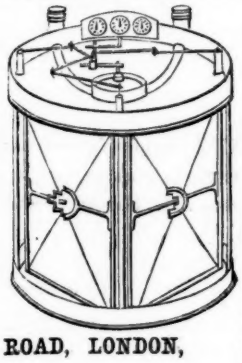
DRY METERS,

GAS-HEATING BATHS, OVENS, STOVES,

GAS FIRES with INDESTRUCTIBLE FUEL,

&c., &c.

PATENT DRY METER.



FACTORY: DIANA PLACE, FITZROY SQUARE. OFFICE: 406, EUSTON ROAD, LONDON,

Eight Doors from Factory.

Attempts having been made to construct Self-Supplying Apparatus to Wet Gas-Meters upon the Bird Fountain principle,—which, although unerring to supply water in the open atmosphere, has not wholly succeeded so as to be relied upon when enclosed in a Gas-tight Meter Case,—N. DEFRIES begs leave most respectfully to acquaint Gas Companies, and the Public in general, that he has constructed his PATENT WET GAS-METER upon a method entirely different, being founded on the well-known principle of the self-acting supply of the Oil Lamp, which has never been applied for the adjustment of the Meter Water-Line before, and which, by the admission of external air to a chamber sealed from Gas, will never fail to faithfully perform its required function. They are of the very best materials and workmanship, will stand more pressure than is required as the test for soundness by the New Act, are guaranteed to prevent surreptitious burning without detection, and will be kept in repair free of charge for seven years.

N. DEFRIES'S CELEBRATED DRY METERS,

of which more than 80,000 are in use in Palaces, Churches, Chapels, Royal Dockyards, Club Houses, Public Offices, and other Buildings throughout the Empire and Continent, which have done so much in checking surreptitious burning, and simplified the fitting up of Gas.

To remove any doubt of accuracy of measurement his Meter for 1500 lights, in use upwards of ten years at the Royal Italian Opera, until that Building was destroyed by Fire, was long afterwards dug out of the burnt ruins, then tested by the Chartered Gas Company in the presence of George Lowe, Esq., F.R.S., and other Chief Officers, and found inflexibly correct. Also, on the 9th of June, 1858, at the Western Gas-Works, his Meter for 150 lights, after considerable use, was doubted, and subjected to the most variable tests—from the full lighting to a single Jet—and in each case, as in other instances, accuracy was finely indicated.

As to durability, his two large Meters at the Thames Tunnel have been in use night and day for upwards of twelve years—one continuation of dark hours—subjected to the wear and tear of seventy-five years as compared with the ordinary business hours of using Gas above ground.

LORD REDESDALE'S SALE OF GAS BILL.

All Meters constructed by N. DEFRIES are guaranteed to pass the Provisions of the Standard.

No alteration has been necessary in the Meters he continues to supply to the Chartered, Imperial, City of London, Equitable, and other large Companies, his accustomed range of 1 per cent. over and under meeting all the desired requirements; whereas, by the New Act, a greater departure from accuracy—viz., 2 per cent. fast to 3 per cent. slow—is permitted.

FIRE-CLAY GAS RETORTS.

ESTABLISHED IN 1795.

JOSEPH CLIFF,

WORTLEY FIRE-BRICK WORKS, near LEEDS.

THESE RETORTS are unrivalled in excellence, being the BEST FINISHED INTERNALLY, and THE MOST CORRECT IN FORM, of any in the Kingdom. From the peculiar composition used in working up the face of the material, they are rendered unusually smooth, close, and FREE FROM SURFACE CRACKS, thus, in a great measure, preventing leakage and the adhesion of carbon to their interior surface.

To meet the yearly increasing demand of UPWARDS OF THIRTY SEASONS and to carry out the late improvements in the manufacture, the Premises have been re-erected and much enlarged, and Engineers may rely WITH CONFIDENCE on their orders being completed with a greater regard to despatch than by any other House.

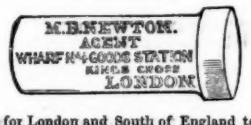
THE WORKS ARE WELL SITUATED

For EXPORT from the Ports of { LONDON, LIVERPOOL, HULL, MIDDLESBRO', HARTLEPOOL, and STOCKTON.

FIRE-BRICKS, LUMPS, GUARDS, TILES, AND CLAY OF THE SAME QUALITY.

M. B. NEWTON, London Agent, No. 4, Wharf, King's Cross Goods Station.

J. CLIFF'S Fire Bricks, Clay RETORTS, &c.



Orders for London and South of England to be addressed to Mr. NEWTON, Agent for the District, 16, Castle Terrace, New Hampstead Road, KENTISH TOWN, N.W.

N.B.—A few Retorts of each size, and a large stock of Bricks and Lumps, always on hand at the above Wharf.

KINSON FIRE BRICKS are indestructible by heat, and are warranted to last twice as long as Stourbridge, Newcastle, or Welsh bricks. 80s. per 1000 at Nine Elms Station.

WORKS: POOLE, DORSET.

WILLIAM RYDER, General MINERAL AND METAL AGENT AND MERCHANT, 4, DEAN STREET, NEWCASTLE-ON-TYNE,

is prepared to supply Gas and Water Companies with Apparatus and Appliances of every description, including Cast and Wrought Iron Goods, Coals, Fire-Bricks, Retorts, &c. &c.

Any communications addressed to him as above shall have prompt attention.

WROUGHT-IRON Guides for Gas. HOLDERS, when Trussed upon scientific principles, are more capable of resisting strains, in every direction, than Cast Columns of any form can be; and weigh only one-fifth as much as the latter. Designs and Working Drawings for Guides and Ties can be obtained of the Inventor, CHARLES DIXON, C.E., Chichester, SUSSEX.

BENJAMIN GIBBONS, Jun., DEEPDALE FIRE-CLAY & BRICK WORKS,

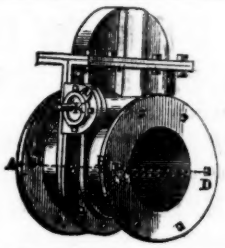
Near DUDLEY,

Manufacturer of every description of Fire-Bricks, Lumps, Quarries, Shields, Flue Covers, &c., to any size or shape required.

FIRE-CLAY RETORTS, TO MODEL OR DRAWING.

B. G. begs to call the attention of Gas Companies to his Fire-Clay Retorts, which have been used with great satisfaction in some of the largest Gas-Works in the Metropolis and many Provincial Towns in England.

References given, if required.



BRYAN DONKIN & CO.

keep always on stock their

IMPROVED GAS VALVES

from 2 inches to 18 inches, price 11s. 6d. to 13s. 6d. per inch diameter

List of prices, with full dimensions of all sizes up to 27 inches, to be had on application.

These Valves are all proved to 30 lbs. on the square inch before leaving the works.

BRYAN DONKIN & CO.,

ENGINEERS,

NEAR GRANGE ROAD, BERMONDSEY.

BIRTLEY IRON WORKS, CHESTER-LE-STREET, DURHAM.

Manufactory for every description of Casting and Machinery for Gas Works and Water Works.

Warehouse in London for Cast-iron Pipes and Connections of all sizes and in any quantity, Scott's Wharf, Bankside, Southwark.

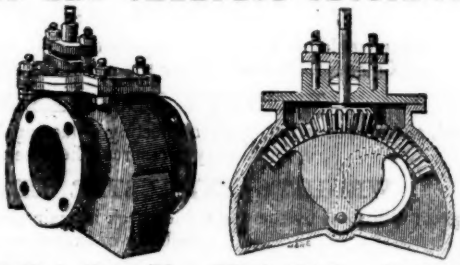
Office in London, Mr. E. M. PERKINS, 78, Lombard Street.

HARRIS and PEARSON PROPRIETORS OF BEST CLASS-HOUSE POT AND CRUCIBLE CLAY. MANUFACTURERS OF **FIRE BRICKS GAS RETORTS &C.**

AMBLECOTE FIRE CLAY AND BRICK WORKS, STOURBRIDGE.

Late in the occupation of I. and W. King. Originally J. Pidcock, Esq.

BEST AND CHEAPEST SLUICE-COCK.



BROWN AND MAY'S PATENT.

Above 3-inch diameter, price 10s. per inch. Brass face, 6d. per inch extra.

Can be taken to pieces without being removed from the line of Piping.

NORTH WILTS FOUNDRY, DEVIZES.

Wholesale Agents, Messrs. S. and E. RANSOME, 31, Essex Street, Strand, E.C.,

Where a Sample may be seen.

WILLIAM INGHAM AND SONS,

WORTLEY FIRE-BRICK AND RETORT WORKS,

Near

Leeds.

W. INGHAM and SONS, having for many years been extensively engaged in the Manufacture of

RETORTS AND FIRE-BRICKS FROM THE CELEBRATED WORTLEY FIRE-CLAY,

beg to call especial attention to their RETORTS, which have for many seasons proved to be unsurpassed in quality by any in the Kingdom, their FREEDOM FROM CRACKS and the ADHESION OF CARBON rendering them worthy the attention of all parties interested in the making of Gas.

The Works are of such magnitude as to ensure the prompt execution of orders to any extent.

Estimates for Setting, or Bricklayers sent when required.

GAS OVENS IN SEGMENTS OF EQUAL QUALITY.

London Agents: CHADWICK and AKEROYD, Willington Stone Wharf, Regent's Park Basin.

A large stock of Fire-Bricks, Fire-Clay, Terra Cotta, and Drain-Pipes of all sizes kept in London at CHRISTIE & CO.—Wharf, 64, Bankside, Southwark, where all particulars of Prices, &c., may be obtained.

N.B.—*Export orders continue to have prompt attention.*

SALE OF GAS ACT.

MESSRS. CROLL, RAIT, AND CO.,

Manufacturers of Croll's Patent Improved

DRY GAS-METER,

Also Manufacture and Supply

TEST GAS-HOLDERS,

And other Apparatus required by the Inspectors appointed in pursuance of the above Act.

Application for particulars to be made to the Factory,

CANAL BRIDGE, KINGSLAND ROAD, LONDON, N.E.

ALEXANDER WRIGHT,

55 and 55A, MILLBANK STREET, WESTMINSTER, S.W.,

MANUFACTURER OF

CONSUMERS' WET GAS-METERS,

Of the best material and workmanship, carefully adjusted to meet the requirements of the SALES OF GAS ACT.

CONSUMERS' COMPENSATING GAS-METERS,

Which have secured the highest approbation and patronage, on account of their simplicity of construction, thorough efficiency, and moderate price.

STATION-METERS AND GOVERNORS,

Of all sizes, constructed with the most careful regard to durability, accuracy, and freedom from excessive friction. A LARGE NUMBER are in use, and give perfect satisfaction.

EXPERIMENTAL TESTING APPARATUS,

COMPRISING

PHOTOMETERS, SPECIFIC GRAVITY APPARATUS, BI-SULPHURET OF CARBON TEST, THOMPSON'S BROMINE AND HEATING POWER OF FUEL TESTS, IMPROVED ALKALIMETER, EXPERIMENTAL METERS AND GOVERNORS, MINUTE CLOCKS, &c., &c.

These apparatus are employed by the best experimenters in this country and on the continent, and by nearly all the Gas Companies in London, for the use of the appointed testers in the various districts.

WRIGHT'S REGISTERING PRESSURE-GAUGE,

Is universally used, and affords valuable aid in effecting a due regulation of pressure, thereby saving much of the leakage arising fromheavy pressures when the consumption is decreasing.

WRIGHT'S EXHAUSTER REGISTER and REGULATOR,

are of the highest utility, as by the one a due check is maintained on the working of the Exhauster, and by the other all possibility of excessive exhaust is avoided.

TEST GASHOLDERS,

Of all sizes, of the most perfect character, accurately graduated to the Exchequer Standard.

Consumers' Governors; Inspectors' Pocket, King's, and all other kinds of Pressure-Gauges; Thermometers for Condensers, &c., &c.

"Analysis of Gas for Practical Men," by A. WRIGHT, M. Inst. C.E., post-free for 13 Stamps.

PRICE-LISTS ON APPLICATION.

D. HULETT and CO., 55 and 56, HIGH HOLBORN, LONDON,

PATENTEES and MANUFACTURERS of the ONLY GOOD MERCURIAL GAS REGULATOR,

invite the attention of Gas Companies and the Trade generally to their Improved GAS-METERS, which they warrant equal to any in Quality, Workmanship, and Simplicity of Construction, and the only Meters from which Gas cannot be obtained without being duly registered.

MANUFACTURERS OF

GAS CHANDELIERS, GLASS LUSTRES, HALL LANTERNS, VESTIBULES, BRACKETS, PENDANTS;

DOUBLE CONE, ALBERT, SHADOWLESS, & EVERY DESCRIPTION OF BURNER, UNION JETS, BATSWINGS, ETC.;

IMPROVED FULL-WAY CARTER'S VALVES (much approved of);

GAS-STOVES, and every article connected with Gas Apparatus.

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